NATIONAL MUSEUM OF VICTORIA

Vol. XXIII. Part 4.

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# The Journal of the Department of Agriculture of Victoria, Australia.

April, 1925.

## PRINCIPAL CONTENTS

Wheat and Its Cultivation

Red Polls in New Zealand

Fertilizers and the Fertilizer Industry

Apricot Growing

Cost of Feeding a Good Dairy Cow

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OF

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## CONTENTS.—APRIL, 1925.


| | | PAGE |
|---|---|---|
| Wheat and Its Cultivation (continued) | *A. E. V. Richardson, M.A., D.Sc.* | 193 |
| Farmyard Manure | | 204 |
| The New Zealand Government Red Poll Herd at Weraroa | *Colonel Arnold Caddy* | 205 |
| Cost of Feeding a Good Dairy Cow | *A. J. Gill* | 215 |
| Rupanyup Crop and Fallow Competitions | *J. E. Harrison, B.Ag.Sc.* | 218 |
| Experiments in Cool Storage of Apples | *D. B. Adam, B.Ag.Sc., and J. E. Harrison, B.Ag.Sc.* | 226 |
| Apricot Growing | *W. H. Nicholls* | 235 |
| Fertilizers and the Fertilizer Industry (continued) | *P. Rankin Scott and W. C. Robertson* | 239 |
| Subsidy for Herd Testing Associations | | 249 |
| Stallion Register, Part IV. | | 252 |
| A Word on Guano | | 254 |
| Orchard and Garden Notes | | 254 |
| Reminders for May | | 256 |



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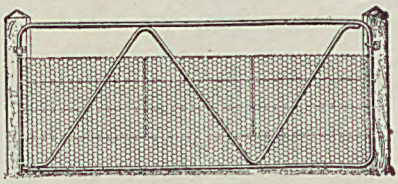

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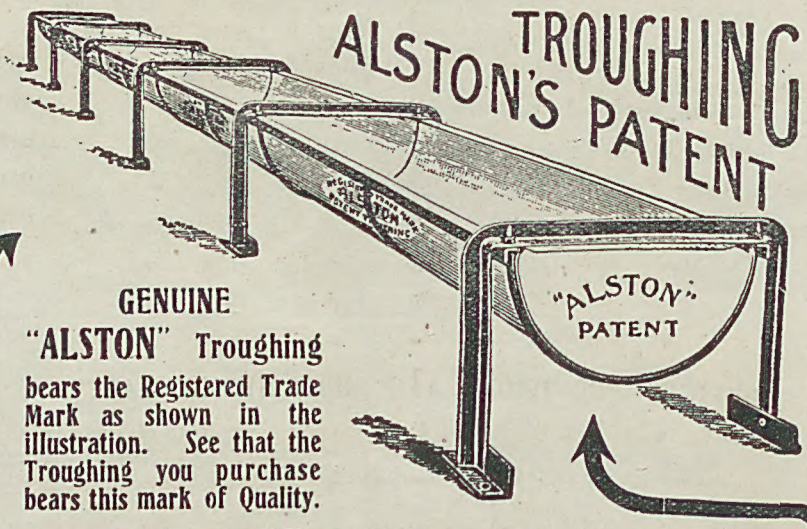


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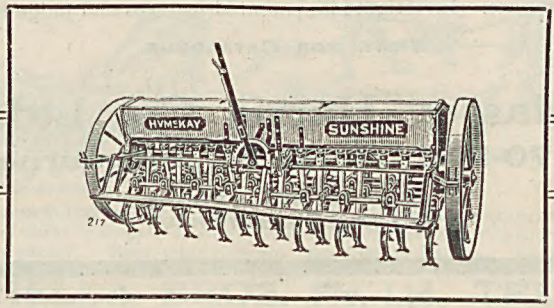


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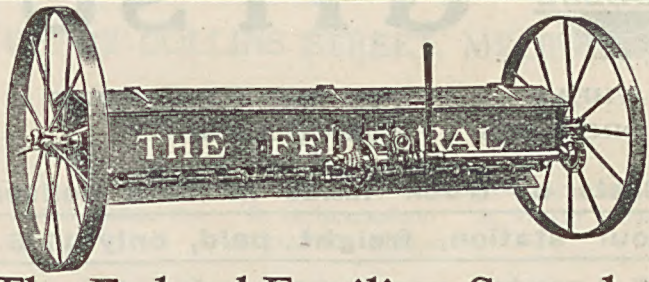


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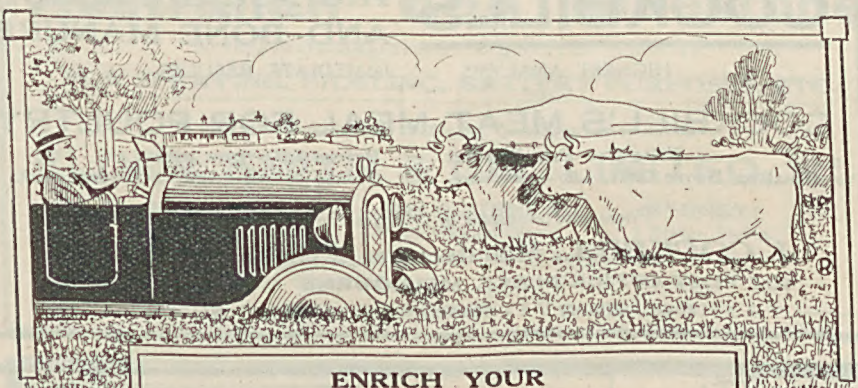

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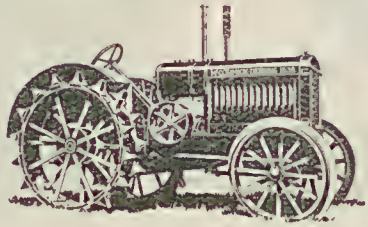

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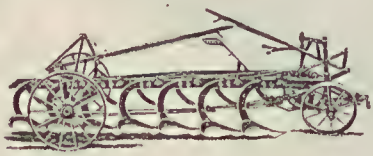

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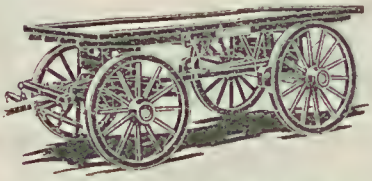

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Vol. XXIII. April, 1925. Part 4.

## WHEAT AND ITS CULTIVATION.

(Continued from page 171.)

*By A. E. V. Richardson, M.A., D.Sc., Director, Waite Agricultural Research Institute, South Australia, late Agricultural Superintendent, Victoria.*

## XIII.—FACTORS FOR SUCCESS IN WHEAT CULTIVATION.

In considering the factors for successful wheat culture in Victoria, it is well to remember that nearly 90 per cent. of the wheat produced there is grown north of the Dividing Range, in a region of relatively low rainfall. The three great wheat districts of the State are the Mallee, the Wimmera, and the Northern areas. During recent years the Western District has become an important wheat area, and is destined to produce in the future an increasing proportion of the wheat of the State.

The average annual rainfall of these areas may be taken as follows:—

Mallee—from 10 to 14 inches.
Wimmera—from 14 to 17½ inches.
Northern—from 14 to 21 inches.
Western District—from 18 to 25 inches.

The greater part of the rain falls from April to October, and the late spring and summer months are invariably hot and dry.

What are the factors for success in wheat cultivation under such conditions? From the point of view of maximum production of wheat per acre we may say that the following are essential:—

(1) Conservation of soil moisture by early fallowing and thorough working of the soil.
(2) Liberal manuring.
(3) Regular crop rotation and association of sheep with wheat-growing.
(4) Rational use of seed.

The observance of these principles will make for the production of good crops and the maintenance of soil fertility. They are the foundation of successful wheat-growing from the cultural stand-point. But more than this is required to make a successful wheat-grower. Business methods and executive ability are quite as important as production methods, for if the wheat and sheep are produced at too great a cost, or marketed unwisely, the farm may bring in but little profit.

An effort must be made to cheapen production at every possible point by good business management and the use of efficient plant and labour.

The wheat-grower must try to discover the point at which increased labour and fertility applied fails to produce more than a corresponding increase in the crop return, and endeavour to reach this point but not pass it.

We may add, therefore, two additional factors which make for success—

(5) Efficient implements and plant.
(6) Good management and business ability.

Consider these points seriatim.

### 1. Conservation of Moisture, Early Fallowing, and Thorough Working of the Fallows.

It is a matter of common observation that well-fallowed land in our wheat districts will grow bushels more wheat per acre than land that has been merely stubble-ploughed. Various experiments in the drier parts of the wheat belt, as well as the practical experience of farmers, have both conclusively demonstrated that more wheat can be grown over a period of years on a given block of land by cropping it every other year than by growing wheat continuously on the same land every year. In these days of costly labour it is becoming more and more necessary to carry out a thoroughly efficient system of cropping. It does not now pay under Victorian conditions to raise small crops. The most profitable system of agriculture under existing economic conditions in the wheat belt is to grow the largest crops possible on those parts of the farm as are reserved for grain. To way to do this is to raise such grain crops less frequently, precede the wheat with a bare fallow, and either pasture occasionally or use forage crops for feeding down with sheep and lambs in a rotation with wheat. This is the keynote of successful wheat-farming in these areas.

It is often stated that the continual practice of bare fallowing deprives the soil of organic matter—the soil's most valuable constituent—and therefore it may be supposed that bare fallowing will gradually impoverish the land. If the land is impoverished, the fault lies not

so much with the practice of bare fallowing as in growing too many grain crops and carting them off the farm instead of growing them in rotation with forages and pasture for feeding down by sheep and lambs.

With the adoption of judicious rotation there need be no fear that the practice of fallowing will ultimately result in soil depletion.

The advantages of the practice of bare following have already been emphasized.

(1) The fundamental principle underlying the practice is that it conserves soil moisture—the limiting factor for successful agriculture in an arid country, and it enables a considerable portion of the rainfall of one year to be conserved in the soil through the summer, and thus to augment the supplies which fall subsequent to the sowing of the crop. It places at the disposal of the wheat crop the rainfall of two seasons.

(2) It distributes the work of the farm evenly throughout the year, and enables the wheat-grower to have ready in autumn large areas of land in the best possible state of tilth to receive the seed as soon as the weather conditions are favorable to seeding. This is a matter of considerable importance in the drier parts of the State, where the normal seeding season is so restricted.

When favorable conditions for seeding exist, it is necessary for the farmer to concentrate his energy, not on the ploughs, but upon the drills. If the ploughing has to be done at seed time, the subsequent seeding must be delayed, and danger arises from the ill-effects of a non-consolidated seed bed.

When it is realized that the main object of fallowing is to conserve moisture, it will be obvious that the sooner fallowing is commenced, the more the moisture that can be conserved, and the better the ultimate prospects of success.

It has been repeatedly demonstrated that land fallowed early gives, in normal years, heavier crops than land fallowed late, whilst in dry seasons the crop grown on early fallowed land is worth bushels per acre more than that raised on land fallowed late.

Summer fallowing has become a common practice in the Wimmera. The black clay loams, which constitute so large a proportion of the Wimmera, are well suited to the adoption of this practice. The land to be prepared for fallowing is skim-ploughed in February or March, or in some cases it is disced. A loose mulch is thus formed on the surface, which not only conserves the moisture, but assists the rapid germination of the weeds with the first rains. In July and August, after seeding is completed, this summer-fallowed land is re-ploughed or scarified. Such land as is ploughed late in spring is immediately worked down with a scarifier or harrows to conserve moisture and eliminate weeds. From spring until the following autumn the land is kept in a friable condition by scarifying or harrowing as often as is necessary to preserve the mulch. On the better lands in the Wimmera from eight to twelve operations are included in this summer working.

In other districts the number of scarifyings or harrowings is much less. The essential point is to keep the top layer of 2½ inches as loose and friable as possible throughout the summer. Fixed tined scarifiers are very popular in the Wimmera, as they can be relied upon to loosen

the hardest soil and suppress weeds. Disc cultivators are less frequently used, though in other districts, especially where the soil tends to set very hard, the disc cultivator does effective work.

No set methods can be recommended for all districts, but the principle of maintaining a loose shallow surface mulch on the soil throughout the summer months must be adhered to if heavy yields are to be obtained. No good purpose is served by merely cultivating the soil when the surface mulch is loose and dry. Cultivation is needed only to break up the surface crust after rain or to destroy weeds. Sheep are very useful on the wheat farm for this latter purpose. They consume weeds on the fallow and assist in consolidating the seed bed.

Thorough tillage, which has as its aim—(1) Preservation of a loose mulch; (2) fining and firming the seed bed; (3) destroying weeds; (4) promoting aeration and bacterial activity—is essential for successful cultivation in regions of low rainfall. In the Wimmera, tillage operations have become more or less standardized, and the methods are well adapted to meet the soil needs and the peculiarities of the climate. In other districts much investigational work is necessary to determine the best combination of tillage methods to suit the soil needs.

The wheat-grower must ever bear in mind that the next season may be a dry one, and the tillage methods adopted should be such as will ensure a successful crop if the rainfall is below the average.

The methods which will secure a favorable crop in a dry year will be suitable also for a normal season. In excessively wet seasons the differences between well-worked and neglected fallows are to some extent levelled down because both types of fallows have sufficient moisture to mature a heavy crop. Such seasons occur but infrequently in the wheat belt, so that on the whole the farmer must adapt his practice to meet the exigencies of normal seasons and years of low rainfall.

The importance of early fallowing and summer fallowing is obvious, but neither early fallowing nor summer fallowing will be of much avail if the fallows are neglected through the summer. A neglected fallow is little better than stubble-ploughed land for raising wheat crops.

There is an old saying that "tillage is the best manure." Very little is known of the changes which take place in the soil constituents as a result of tillage. We do know, however, that nitrates are rapidly formed in well-worked fallows, and that by seed time sufficient is available in the soil to bring the heaviest wheat crop to maturity.

There is reason to believe that other mineral nutrients are made available for the use of the crop, though it would doubtless be very difficult to show this by chemical analysis. The soil contains enormous reserves of dormant plant food, and the aim of the farmer should be to render as much of this available as possible by thorough and frequent cultivation. The more thoroughly the soil is tilled, the more available plant food will be formed, and the less will be the manure bill. It is in this sense that "thorough tillage is a substitute for manure." Jethro Tull recognized this fact over 150 years ago, and founded his "Horse-hoeing Husbandry" on it.

A fine illustration of the value of thorough tillage is shown in the results of the manurial tests at Longerenong. The unmanured plot at Longerenong for a ten-year period average 29½ bushels. For the past decade a well-worked fallow, without fertilizer, has averaged at this

centre nearly 30 bushels per acre—a yield more than double that of the State.

Finally, apart from conservation of moisture, extermination of weeds and production of available mineral nutrients, there is one other important advantage from thorough tillage, namely, the consolidation of the seed-bed.

Every experienced wheat-grower knows how important it is to have a firm, finely divided, consolidated seed-bed for his wheat crop. Oats or barley will thrive on loose open seed-beds, but for wheat a firm, finely divided seed-bed is essential for success.

The consolidation of the seed-bed cannot be secured in a week or a month. Time is a necessary factor for the process, and the consolidation is brought about by the packing action of the rain and the frequent stirring of the soil. Such a seed-bed, resting on a moisture-laden subsoil, is in the very best condition, not only for resisting dry spells, but also for yielding heavy crops.

The advantage of a fine, firm seed-bed in a dry season is very marked. The finely divided soil particles act as an unbroken series of force pumps on the storage reservoir below, and keep the roots rapidly and constantly supplied with moisture.

With a loose, open, cloddy seed-bed capillary action is slow and irregular, and in time of stress the crop will suffer. Such a seed-bed is the invariable result of hasty preparation of the soil. The best preparation for a wheat crop in districts with a limited annual rainfall, the bulk of which falls between April and October, is to fallow early and well, to keep the soil thoroughly cultivated through the summer, and to be ready to concentrate the whole strength of the farm on the drills and cultivators when the first favorable autumnal rains fall.

The benefits of preceding the wheat crop with a bare fallow are shown by the results of field tests at the Experimental Farms:—

Table XXXI.—Showing Results of Tests—Werribee, Longerenong, and Rutherglen.

| | Bushels per acre. |
|---|---|
| 1. *Werribee—Average of nine years—* | |
| Wheat continuously .. .. .. | 7.0 |
| Pasture, fallow, wheat .. .. .. | 17.1 |
| Oats, pasture, fallow, wheat .. .. | 17.7 |
| 2. *Longerenong*—Average of six years— | |
| Wheat continuously .. .. .. | 11.17 |
| Wheat after bare fallow .. .. .. | 34.03 |
| Wheat, pasture, bare fallow .. .. | 35.52 |
| Wheat, oats, bare fallow .. .. .. | 38.05 |
| Wheat, oats, pasture, fallow .. .. | 37.08 |
| *Rutherglen Experimental Farm—Average of five years—* | |
| 1. Ploughed 5 inches in July and worked through the summer .. .. .. | 17.5 |
| 2. Ploughed 5 inches in July and not worked through the summer .. .. .. | 12.8 |
| 3. Ploughed 5 inches in autumn, just before seeding .. .. .. .. | 7.4 |

### 2. Liberal Use of Soluble Phosphates.

The guiding principle in the use of manures is to encourage the formation of soluble mineral nutrients by thorough tillage, and supplement any deficiencies with fertilizers. Actual experiment is the best means of determining those soil needs. The problem for the farmer is to discover the most economical and profitable way of supplying these needs. Speaking generally, the chief deficiencies of Victorian wheat soils are organic matter and phosphoric acid. Increasing the organic content of the soil is a very difficult problem for the wheat-grower on account of the large area of a wheat farm and the very limited supplies of organic matter available for this purpose. Indirect means, e.g., crop rotations and pasturing, may possibly counteract the great losses of organic matter which result from bare fallowing. The rate at which organic matter is lost and may be replenished in Victorian wheat soils is a matter for investigation.

Except in wet seasons and in districts of heavy rainfall, the use of stable manure does not materially increase wheat yields. Though the organic content of Victorian wheat soils is low and the amount of nitrogen present much less than in European soils, experimental work has shown that nitrates are unnecessary in all but the wetter areas. Adequate reasons have been furnished for this lack of response to nitrates.

So far as phosphates are concerned, practical experience and the results of numerous experiments have demonstrated that the most profitable method of applying phosphates is in the form of superphosphate. The amount to be used with greatest profit depends on (1) the rainfall, (2) the soil, (3) the thoroughness of cultivation.

In districts of light rainfall, e.g., the Mallee, light dressings have been used in the past, e.g., 30 to 40 lb. But even in the driest portion of the Mallee, e.g., Carwarp, field experiments have shown definitely that 60 to 90 lb. may be used with advantage.

On soils rich in calcium carbonate heavy dressings are required, for reversion is probably very rapid on these soils. Thus on limestone soils in South Australia from 1½ to 2 cwt. are regularly used, and such dressings have a stimulating effect on the quantity and quality of the subsequent grazing.

Finally, the amount which can be profitably used depends on the thoroughness of the cultivation methods. With indifferent cultivation the level of production is always low, no matter what quality of seed is used or how much fertilizer is applied. Liberal use of fertilizers cannot make up for deficiencies in cultural methods. With the adoption of thorough tillage methods, the full benefit of liberal fertilizing is obtained.

The average amount of superphosphate used per acre in 1911 in the wheat districts of Victoria was as follows:—Mallee, 47 lb.; Wimmera, 59 lb.; Northern, 61 lb.; North-east, 71 lb.; Western District, 95 lb. Since then the quantity used per acre has been steadily increasing. Notwithstanding the conclusive results obtained on departmental farms and on farmers' experimental plots throughout the State of the value of liberal dressings of phosphate, wheat-growers as a whole have been conservative in applying the lessons from the experiments.

During the past few years the manufacturers of superphosphate have been conducting extensive propaganda work with the object of increasing its consumption.

Table XXXII.—Showing Results of Tests with Light and Heavy Dressings of Superphosphate.

| —— | Longerenong (10 years' Average). | Rutherglen 6 (years' Average.) | Werribee (10 years' Average). | Average at all Centres. |
|---|---|---|---|---|
| | bush. | bush. | bush. | |
| No Manure .. .. | 29·2 | 9·8 | 7·8 | 15·6 |
| ½ cwt. super .. .. | 33·3 | 14·8 | 13·6 | 20·6 |
| 1 cwt. super .. .. | 34·3 | 15·7 | 15·6 | 21·9 |
| 2 cwt. super .. .. | 36·9 | 16·3 | 16·8 | 22·3 |

These results demonstrate that heavy dressings of superphosphate give a higher yield and a more profitable yield than the ½-cwt. application.

Valuing the wheat at 4s. 6d. per bushel, its approximate average value for the period under review, and superphosphate at 5s. per cwt., the net profit from each applications works out as follows:—

Table XXXIII.—Showing Average Net Profit per Acre from Light and Heavy Applications of Superphosphate at Longerenong, Werribee, and Rutherglen for the Past Decade.

| —— | Yield. | Increase over unmanured Plot. | Value of increase at 4s. 6d. per Bushel. | Cost of Fertiliser. | Net Profit per Acre. |
|---|---|---|---|---|---|
| | bush. | bush. | *s. d.* | *s. d.* | *s. d.* |
| No Manure .. | 15·6 | .. | .. | .. | .. |
| ½ cwt. super .. | 20·6 | 5·0 | 22 6 | 2 6 | 20 0 |
| 1 cwt. super .. | 21·9 | 6·3 | 28 4 | 5 0 | 23 4 |
| 2 cwt. super .. | 23·3 | 7·7 | 34 8 | 10 0 | 24 8 |

Even if the heavier dressings gave no greater net profit than the ½-cwt. dressing, there is the indirect effect of the liberal dressings to take into consideration. Heavy dressings of superphosphate lead to increased growth of pasture when the land is left in pasture. This is a common experience in the wheat belt. The indirect effect of heavy dressings on the growth of grass on stubbles is very marked at Werribee during winter and spring. Thus the stock-carrying capacity of a wheat farm may be gradually increased by a policy of liberal dressings with phosphates. Not only is the maximum wheat crop obtained from liberal dressings of superphosphate, but the quantity, and certainly the quality, of the grass is greatly improved.

Experiments have shown that the application of liberal dressings of phosphate result in the economical use of the water supply and a low Transpiration Ratio. This does not mean that a manured crop requires less water than an unmanured crop. In fact, a manured crop generally uses more water, because it grows vigorously and usually has a greater leaf surface from which transpiration takes place. But transpiration is

a physical phenomenon depending mainly on the evaporating power of the atmosphere (i.e., air temperature, relative humidity and wind velocity) and the water-content of the leaf.

With a liberally manured crop the plant grows vigorously without check, and it is increasing in dry matter economically throughout the whole period that it is transpiring water. But on an unmanured soil or an infertile soil, or a soil in which soluble phosphate is wanting, the plant is transpiring water continuously (as a resultant of the physical environmental factors), but owing to lack of phosphates, growth, i.e., increase in dry matter, may be suspended, with the result that the Transpiration Ratio for the unmanured crop may be excessively high.

Any factors which assist a crop to grow in a normal or a vigorous manner will bring about a reduction in the Transpiration Ratio for the same reason.

Summing up, we may say that there can be no doubt as to the value of voluble phosphates for the whole of the wheat belt, but the quantity of phosphate to apply will vary with the rainfall, the soil, and with the standard of the cultural methods employed, and that the tendency will be for more liberal dressings of fertilizer to be used. The best quantity to use under any given set of circumstances can be determined only by actual field experiments over a series of years.

Liberal dressings are justified, especially if *cultural methods are thorough,* to give the maximum yield possible on the rainfall, and to stimulate the subsequent growth of grass on the stubbles and increase the stock-carrying capacity of the farm.

### 3. Regular Crop Rotation and Association of Sheep with Wheat Growing.

The outstanding weakness in our system of wheat culture is that in many cases little or no provision is made for the restoration of organic matter. It is well known that the losses of organic matter due to fallowing in an arid climate are very considerable. The fertility of the soil depends very largely on its organic portion. Deprive the soil of its organic matter and you have rock dust, and what farmer would care to farm a soil made of pulverized bricks?

The presence of organic matter in ample quantity is a guarantee that the soil can be made productive. Organic matter greatly increases the water-holding capacity of the soil, vastly improves its texture and mechanical condition, and is the material round which all biological activities in the soil are centred. The superior productivity of virgin land as compared with land cropped with cereals for several generations is a matter of common observation. Were the differences in production due to mere loss of mineral matter, we could easily restore the soil to its pristine fertility by the application of artificial fertilizers.

The difference in fertility is largely due to the depletion of the organic matter in the cropped soil. The organic matter might be restored in three ways—(1) Application of stable manure; (2) ploughing in of green manures; (3) pasturing the land and feeding down forage crops with stock. The two former methods are impracticable on wheat farms. The introduction of pasture into the rotation or the feeding down of forage crops with sheep is, however, entirely practicable.

Systems of crop rotation that can be recommended in the light of present knowledge are the following:—

1. For the dry Mallee areas—
   (1) Wheat, (2) pasture, (3) bare fallow.
2. For the Wimmera—
   (*a*) (1) Wheat, (2) oats, (3) fallow.
   (*b*) (1) Wheat, (2) oats, (3) pasture, (4) bare fallow.
   (*c*) (1) Wheat, (2) oats for grazing, (3) bare fallow.
3. For the Western District—
   (1) Wheat, (2) oats, (3) green forage, e.g., peas, rape, or oats fed to sheep.

The rotations prescribed for the Mallee and Wimmera require a minimum of labour, and are well adapted to areas where the rainfall is not heavy and the land is held in fairly large areas. In most districts, and grass and herbage which spring up spontaneously from the wheat stubbles are not of high grazing value, especially where well worked fallows are included in the rotation, for the object aimed at in fallowing is to suppress all herbage and allow the wheat crop undisputed possession of the soil. That this fact is recognized is seen by the practice often followed in the Wimmera and Western District, where, instead of relying on this adventitious herbage springing up on the wheat stubbles, a crop of Algerian oats is disced in on the wheat stubbles in March and April to provide winter grazing for sheep.

In the areas of more liberal rainfall, something more than one crop in three or four years is possible. Here peas, rye and vetches, rape, mustard, kale, Sudan grass, Japanese millet, or mixed forages can be grown successfully in addition to cereal crops, and in these cases wheat should be grown in alternation with forage crops and for feeding down on the land with stock. Wherever such forage crops can be grown in regular rotation with wheat, the maintenance of fertility can be assured.

A green forage crop obtains 95 per cent. of its total solid matter from the carbonic acid gas of the air. When the crop is fed to stock, the greater portion of the organic matter is returned to the soil. As the amount of green forage produced is usually many times greater than the total amount of herbage on the uncultivated wheat stubbles, it follows that the feeding down of forage crops is the best corrective for the loss of organic matter which is an inevitable consequence of bare-fallowing a soil in a hot, dry climate. Crop rotation has other advantages, apart from the question of maintaining the fertility of the soil.

Crop rotation leads to more healthy crops. Take-all, Flag Smut, and other fungoid diseases, are much less common on land on which a regular cropping sequence is maintained. It enables the farm work to be better distributed through the year, more sheep to be kept, and it assures a heavy wheat yield.

## Sheep on the Wheat Farm.

The association of sheep with wheat-growing presents many advantages. The sheep utilize roughage on the farm which could not be

otherwise used for profit. They do well in the stubbles of the wheat crop, utilize the herbage of the lay land, and keep the fallows clean and well consolidated.

They work in well with wheat, for the maximum demands of a flock of ewes with their lambs are made when there is a flush of spring herbage, and the lambs are usually sold before the grass begins to go off. They utilize the herbage on the fallows, and assist in bringing about that consolidation of the seed bed so necessary for a successful wheat crop. This is of importance in country which is light in character. They assist in maintaining the fertility of the farm, for much of the phosphoric acid, potash and nitrogen found in the herbage is returned to the soil in the droppings of the sheep. This is especially true of a flock of mature animals.

They add to the profits of the farm on account of the relatively small amount of labour and attention required by the farm flock in comparison with the actual money returns. The high prices ruling for both mutton, fat lambs, and wool, the rapid development of the frozen meat trade, and the rise of country cool stores, make it essential for a wheat-grower to keep sheep in order to extract the maximum net profit from his farm.

The extent to which wheat-growing is associated with sheep-rearing may be shown by the ratio of sheep to wheat cultivated in the three important wheat provinces of the State. This is brought out in the following table:—

TABLE XXXIV.—SHOWING THE NUMBER OF SHEEP DEPASTURED IN 1919 IN THE CHIEF WHEAT PROVINCES OF VICTORIA.

| District. | Number of Sheep, 1919. | Areas of Wheat Sown, 1919. | Number of Sheep for each Acre of Wheat. |
|---|---|---|---|
| 1. Mallee .. .. .. .. | 841,155 | 942,112 | ·9 |
| 2. Wimmera .. .. .. | 2,442,365 | 608,709 | 4·0 |
| 3. Northern .. .. .. .. | 2,504,177 | 550,461 | 4·6 |

NUMBER OF SHEEP THAT CAN BE KEPT ON A WHEAT FARM.

This is a question that cannot be easily settled. The stocking capacity of the farm can, however, be readily determined. The number of sheep that can be carried through the worst season of the year—autumn and early winter—determines the number that can safely be carried throughout the year. This, of course, implies that if the stock can be carried over the worst portion of the year, much feed must necessarily be wasted at the best time of the year, i.e., spring and early summer. If we judge a wheat farm by this test, we should find its carrying capacity very limited. It must always be borne in mind that the conditions on the farm are very different from those on the station. The mainstay of the station property is the permanent native grasses and the annual growths of weeds and grasses which may have established themselves throughout the native pasture. On the wheat farm the rooted grasses—permanent native grasses—are destroyed in the process of fallowing, and the pastures therefore consist mainly of weeds and annual plants.

In addition there are, of course, the wheat stubbles, and such herbage as may grow on the fallow. While, therefore, the stock-carrying capacity of the station land may be estimated with a fair degree of accuracy, the carrying capacity of the wheat farm will be a very variable quantity, and largely dependent on the nature of the season. The handling of a flock on the relatively small area of the wheat farm needs a good deal of experience. Station sheep are often not moved throughout the year. On a wheat farm, the paddocks must be cultivated in rotation, and we could not expect to carry successfully a flock of sheep continuously grazing on the relatively small area of land left out for pasture. To stock a wheat farm to full capacity, it is desirable to have relatively small fields, and it is probable that four 50-acre paddocks would carry double the number of sheep that could be carried on one 200-acre paddock.

### Keep Sheep on Every Wheat Farm.

With the establishment of the fat-lamb industry on a sound and profitable basis, and the high prices ruling since the war for wool—both crossbred and merino—keeping of sheep on the wheat farm has become a matter of great importance.

The wheat-grower has a choice of operating in two ways: (1) the purchase of store sheep for fattening; (2) the keeping of a small flock for raising fat lambs or the production of wool.

If at any time he has available a good grazing area, he can buy store sheep and fatten them, and realize the profit which normally results from the difference in price between store and fat sheep. Usually, however, the wheat-grower is not advantageously placed to profit by this somewhat speculative form of enterprise.

The best practice to follow is to keep a flock of ewes in numbers adapted to the carrying area of the farm at the lean period of the year, and raise crossbred lambs for disposal in spring. The usual practice is to buy two- or four-toothed crossbred ewes from station-bred flocks, to mate these with early maturing British breeds of rams, and after taking, say, three annual crops of lambs, to fatten the ewes for market. The relative merits of the different breeds lie beyond the scope of this article. We merely emphasize here the necessity for associating sheep with wheat. The highest profits, and ultimately the cleanest crops and best wheat yields, will be obtained on those farms where sheep are constantly used to graze fodder crops and pastures, clean up the fallows, and consume the greater part of the stubbles.

### 4. Rational Use of Seed.

In order to get the best results from early fallowed, carefully worked, properly rotated, rationally manured land, the seed sown should be the best the farmer can secure.

The first requirement is to secure varieties suited to the district. The farmer has a large number of varieties to select from, and he should study carefully the yields of local experimental plots conducted by the Department of Agriculture, and even test a few varieties on a small scale. The experience of farmers in the district, and the results of district experiments, will be invaluable in arriving at a selection of, say, two or three types.

He should endeavour to raise his own seed, and occasionally secure seed from the Department of Agriculture or the Agricultural Colleges. These institutions have the time, the experience, and the facilities for producing high-grade, select-bred, graded seed. The seed for the farm area should be sown in the cleanest and best worked area of the farm. It is the usual practice to begin seeding with the latest maturing type, and complete the seeding with the early-maturing types, and to increase the dressing of seed and manure as the seeding season progresses.

Experiments have shown that it pays to grade wheat for seed.

A good grader removes weed seeds, grains of other cereals, rubbish, damaged and cracked grain, and thus separates material of considerable commercial value for feed, but of negligible value for seed. The graded residue is more prolific than the ungraded product.

Finally, seed wheat should always be pickled, either with bluestone (1½ lb. to 10 gallons of water), formalin (1 lb. of formalin to 45 gallons of water), or with powdered copper-carbonate (1 to 2 oz. per bushel of seed). The advantages of pickling with the dry fungicide have already been discussed in Chapter VI.—(*Journal of Agriculture*, August, 1924.)

(*To be continued.*)

## FARMYARD MANURE.

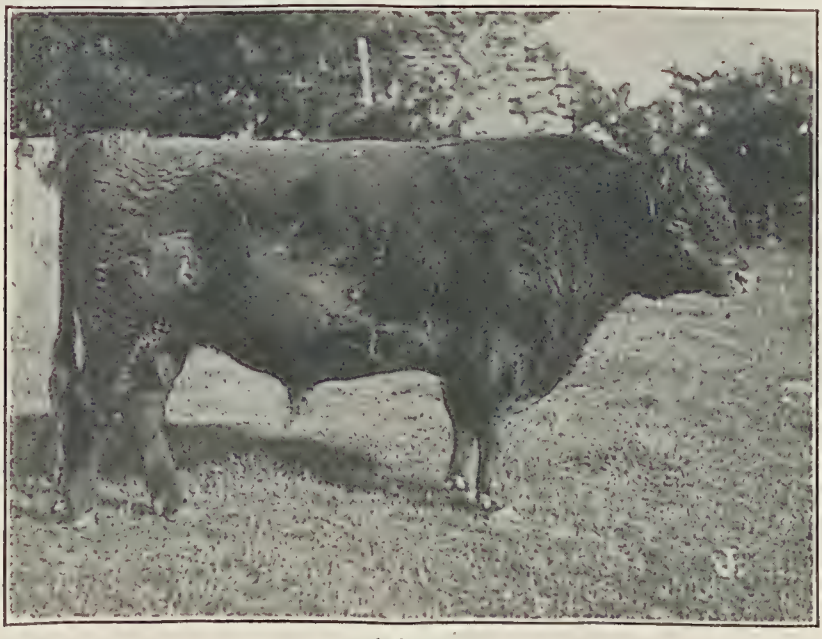
In a consideration of the value of farmyard manure due allowance must be made for more than the actual commercial value of its fertilizing ingredients. It must be clear that the fertility of the soil is dependent upon more than the addition of so-called plant-foods. For instance, the humus content, which is one of the most important factors in fertility upkeep, can be largely depleted by the production of annual crops which are almost entirely removed. In order to be quite clear on the position one must first recognize that there is a distinction between what are known as manures and those termed artificial fertilizers, the chief difference being in respect to the other important functions of, for example, farmyard manure. For while an organic manure supplies plant-food, it also aids in the general improvement of plant-foods already in the soil to a very marked degree, while the artificial fertilizer as a rule only furnishes plant-food.

Another important factor of all fertile soils is texture, and here again farmyard manure exerts a very beneficial influence. The mechanical and physical benefits derived by soil from an addition of such manure are very important. The benefits extend alike to light and heavy soils. In light soils organic matter—frequently so deficient, and which no amount of artificial fertilizer can make up for—is supplied by farmyard manure, while at the same time the latter assists consolidation and retention of moisture. The advantages to heavy clay soils, although in a different direction, are no less marked. It makes their working much easier by opening the soil-mass to the beneficial influences of warmth, aeration, and oxidation. It will therefore be realized that farmyard manure is unique in its effect, and that it must be given credit for more than its actual commercial value as a plant-food.—(New Zealand *Journal of Agriculture*, January, 1925.)

# THE NEW ZEALAND GOVERNMENT RED POLL HERD AT WERAROA

*Contributed by Colonel Arnold Caddy.*

The Central Development Farm, at Weraroa, near the town of Levin, is charmingly situated on the plains facing the sea on the west and backed by the volcanic Taranui Mountains on the east. It is 113 feet above sea level, and lies 60 miles north of Wellington, on the main Auckland-Wellington line of rail. Its area is 800 acres. The soil is a volcanic alluvium overlying boulders. Originally the land was covered with dense native bush, of which a few patches have been preserved on the south side as scenic reserves, and these contain tree ferns, palms, native pines, honeysuckle, rata, and lawyer vines, &c. The farm is subdivided



**Aviator.**
(Photograph taken during his first winter in New Zealand.)

into 34 paddocks, which are mostly surrounded by narrow plantations of pines, and cypress, thus affording the best of shelter from the winds that blow across the Tasman Sea. The average rainfall is 38 inches, well distributed over the year. In winter 8 degrees of frost have been recorded, but as a general rule there are no extremes of temperature, and grass grows all the year round.

The farm was started in 1894 as a Labour Colony, to make work for the unemployed of the City of Wellington. In 1899 it was transferred to the Department of Agriculture as an experiment farm, and a Friesian herd was early established there. In 1918 an arrangement was arrived at between the Departments of Agriculture of New Zealand and Victoria, whereby an exchange was effected of some Friesian cattle from Weraroa for some Red Polls from the State Research Farm at Werribee,

and the following Red Polls were safely transferred to their new home:—

Bulls—

"Aviator," 103A, by "Belligerent," imp., 8AA, *ex* "Avesia," 287B.

"Force Majeure," 162C, by "Longford Major," imp., 55AA, *ex* "Muria," 491D.

Females—

"Pipio," 500D, by "Tabacum," 90AA, *ex* "Connecticut," by "Redman," 217D.

"Goldleaf," 412C, by "Tabacum," 90AA, *ex* "Bullion," 544D, by "Battery," 189D.

"Lallah," 413C, by "Nicotine," 69AA, *ex* "Persica," 551D, by "Prince of Wales," 215D.

"Sylph," 417C, by "The Hindoo," 179C, *ex* "Sylvia," 552D, by "Tabacum," 90AA.

"Opticia," 335B, by "Nicotine," 69AA, *ex* "Birdseye," 377C, by "Tabacum," 90AA.

"Superior," 501D, by "Honingham Alake," imp., 45AA, *ex* "Americana," by "Magician," imp., 57AA.

"Andesia," 498D, by "Nicotine," 69AA, *ex* "Alpina," by "Duke of Melton," 198D.

"Calabash," 404C, by "Nicotine," 69AA, *ex* "Pipio," 500D, by "Tabacum," 90AA.

"Matanga," 499D, by "Nicotine," 69AA, *ex* "Cuba," by "Redman," 217D.

"Gold Top," 334B, by "Nicotine," 69AA, *ex* "Goldleaf," 412C, by "Tabacum," 90AA.

"The Landing," 418C, by "Nicotine," 69AA, *ex* "Gallipoli," 547D, by "Redman," 217D.

"Tablemount," 337B, by "Belmont," 10AA, *ex* "Tabasco," 422C, by "Tabacum," 90AA.

"Algeria," 328B, by "Belligerent," imp., 8AA, *ex* "Barbary," 467C, by "Acton Dewstone," imp., 4AA.

"Uralia," 502D, by "Longford Major," imp., 55AA, *ex* "Alpina," by "Duke of Melton," 198D.

"Melanesia," 414C, by "Cigar," 193D, *ex* "Pacifica," by "Acton Dewstone," imp., 4AA.

"Concertina," 260A, by "Belligerent," imp., 8AA, *ex* "Samotina," 317B, by "Nicotine," 69AA.

"Lucky Hit," 264A, by "Longford Major," imp., 55AA, *ex* "Aridia," 277A, by Honingham Archbishop," imp., 48AA.

"Santa Anna," 416C, by "Longford Major," imp., 55AA, *ex* "Santa Clara," 557D, by "Nicotine," 69AA.

"Orange," 336B, by "Longford Major," imp., 55AA, *ex* "Africana," 466C, by "Magician," imp., 57AA.

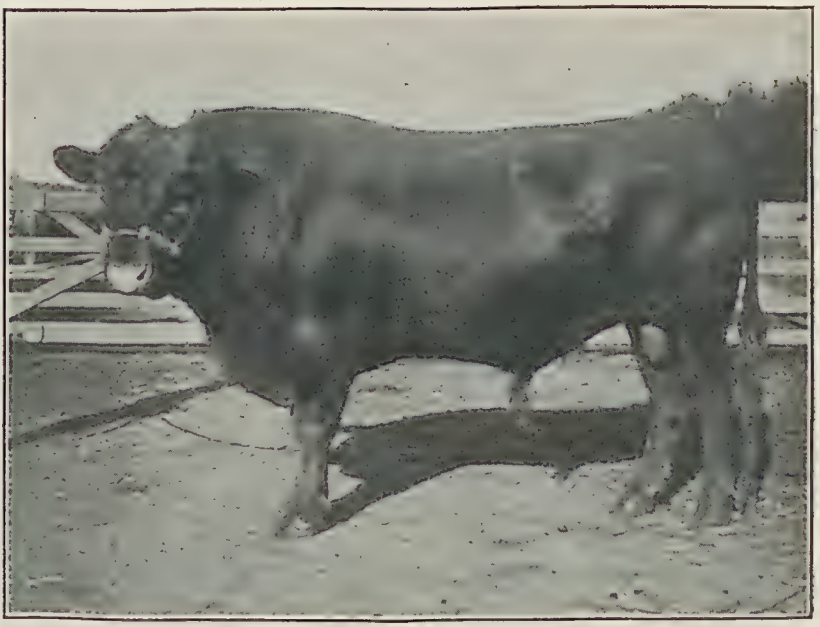
"Neutral," 415C, by "Belligerent," imp., 8AA, *ex* "Netherlana," 492D, by "Melton Prince," 207D.

In October, 1923, the N.Z. Department of Agriculture imported "Gresham Masterful," 12631, from England, bred by Lieut.-Colonel R. C. Watt, Gresham Hall, Norfolk. He is by "Gresham Floras," 11655, who traces back to "Acton Crowfoot" and "Désirée of Johnstown"; his dam is "Gresham Aster," 26858, who traces back to "Davyson 265th," 9320; so he has heavy milk-producing blood on both sides.

Since the foundation of this herd, other than the three above bulls, the only sires that have been used in the herd are—

1. "Dominion Sylvan," by "Force Majeure," *ex* "Dominion Sylvaine," *ex* Sylph."
2. "Dominion Sylvanus," by "Aviator," *ex* "Sylph."
3. "Dominion Optician," *ex* "Opticia."
4. "Dominion Pilot," by "Aviator."

"Dominion Sylvan" and "Dominion Optician" have been sold, and "Aviator," and "Force Majeure" were disposed of twelve months ago. The remaining sires are of outstanding merit, especially the imported bull, though "Dominion Pilot" is a trifle light in colour, and might show more masculinity in his head.



**Force Majeure.**

The herd comprised, on 30th September, 1924, 3 stud bulls, 9 yearling bulls, 15 bull calves, 32 cows in milk, 1 cow with calf at foot, 13 dry cows, 3 2-year old heifers, 14 yearling heifers, 7 heifer calves, and 5 steers under 2 years old. Total, 102. There is also one interesting crossbred heifer, accidentally sired by a Red Poll bull out of the Friesian cow "Dominion Jessie Beets." This animal is a whole jet black colour and hornless, but is is well grown and will probably be mated in due course with a Red Poll bull as an experiment. All stock are sold at public auction and fetch good prices.

The first thing that strikes the visitor to Weraroa is the good pastures, and as a result a general sleek look of healthy contentment is present in all the live stock. Top dressing with phosphate of lime is answerable for this, and, as elsewhere, that fertilizer causes the Red Polls to spend most of their time resting and chewing the cud, instead of wandering about restlessly looking for vitaminiferous feed. As a result

of careful selection the Red Polls are excellent examples of the dual purpose type—of good colour and conformation, being low set, and showing plenty of depth of carcass, with good top lines. In the short pedigrees above given it will be noted that the name of the bull "Tabacum," 90AA, occurs frequently, and he is largely answerable for this depth and squareness of outline. There are, however, a few cases of drooping rump, which is seen mostly in those animals that trace back to that famous old cow "Pennsylvania," the dam of "Sylvia" and the grand dam of "Sylph." On the whole they are a very level-looking lot, showing well sprung ribs, and this is specially the case with the stock got by "Aviator," though "Force Majeure" has left the better milk producers, and it is interesting to hear this, because the stock descended from "Muria," 491D, have been somewhat unequal in spite of her

**Gresham Masterful (imp.)**
(Born 31.1.22.)

marvellous record in 1914, when, on her fifth calf, she gave 14,792 lb. milk, 885 lb. butter fat, with a test of 5.9 per cent. The udders of the Red Polls at Weraroa are receiving attention, and though many cows show lack of balance in the quarters, especially in front, yet there are some whose milk vessels call for little improvement.

The herd is remarkably healthy. The tuberculin test is applied regularly, and in but very few cases with a positive reaction. One noticeable feature in the Red Poll herd compared with the Friesian herd that is also kept at Weraroa, is the ease in calving. The Red Polls hardly ever require assistance, whereas in the case of the Friesian heifers the majority call for some help at calving time. One heard the same story when visiting some of the British herds of Red Polls, but in England heifers are not as a rule served until after they are two years old, the maturity gained by waiting being considered of advantage, and

it certainly does not interfere with the milk production in any way. However, one often hears it said that in order to develop the milk-giving faculty a heifer should be served so as to come in at two years old. It is not easy to find a scientific reason for this idea, but perhaps economic factors on a farm can better explain it, and the want of an adequate bull paddock may contribute to it also.

At Weraroa the cows are fed mostly on the pastures, except for a little meadow hay, soft turnips and mangolds in winter, and a little green maize at times, though last year, owing to the excellence of the grass, the cows would not touch the maize. There is a silo on the farm, which is now never used.

Among the calves one noticed a young bull showing great quality, dropped on 24th July, 1924. He is by "Gresham Masterful," *ex* "Dominion Louvain," B71, who was champion cow at the New Zealand

**Superior.**

Royal Show on 5th November last. A heifer calf also attracted attention. She was by "Gresham Masterful," *ex* "Dominion Lady Nicotine," B69. She was a deep ruby colour, and showed great promise. At the same Royal Show was exhibited "Dominion Zeeland," calved 11th November, 1923, by "Dominion Sylvan," C62, *ex* "Dominion Netherlana," C110, which was also the dam of "Dominion Louvain." This heifer is a perfect specimen of the breed, and was awarded the N.Z.R.P. Association's silver challenge cup as being the best female Red Poll of any age. The heifer who won the second prize in the same class was "Dominion Miss Cavell," by "Dominion Sylvan," C62, *ex* "Neutral," C130, who was the dam of "Dominion Netherlana." "The Sylph" and "Neutral" strains are regarded at Weraroa as the best for milk production. The senior stud bull "Gresham Masterful," imp., is a splendid example of the breed, being of a dark colour, with pronounced masculinity of head and an active carriage, and if he continues as he has begun, his presence here will do much to uplift the breed in New

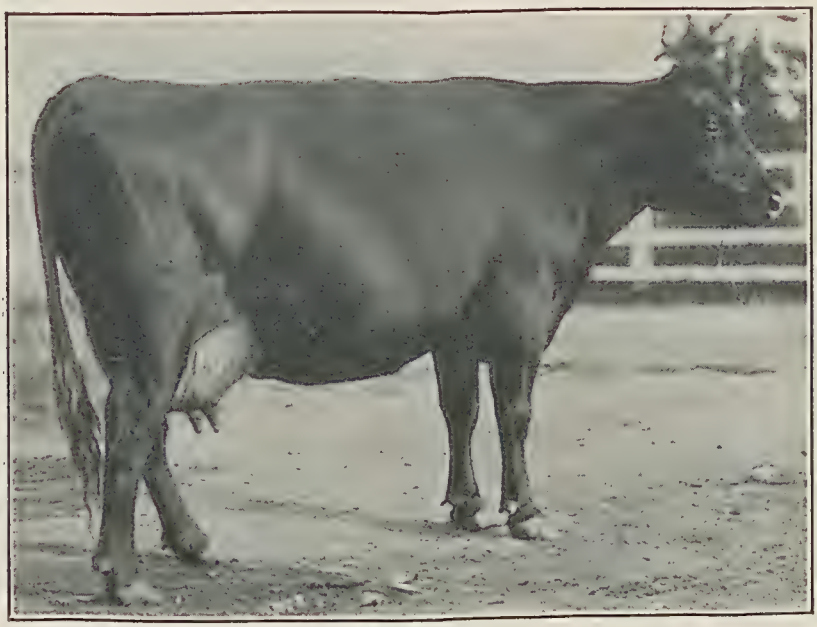
Zealand generally. Running with "Gresham Masterful" one noticed "Dominion Sweet Briar," by "Aviator," *ex* "Dominion Briar Rose," C100, who is a daughter of "Calabash." This heifer, it is to be hoped, will be shown another year; but it was not practicable to take more than two young heifers to the last Royal Show.

Among the cows one noticed "Silken Lashes," by "Force Majeure," *ex* "Optician," B83, with a beautifully developed udder, showing an equal differentiation of the four quarters in a marked degree. There is also "Dominion Mona," by "Aviator," *ex* "Dominion Major's Daughter," B72, who had the misfortune to slip her first calf, which has spoilt her record; but nevertheless a beautifully shaped specimen, though a trifle on the small side. "Dominion Morocco," B74, by "Force Majeure," *ex* "Algeria," B65, is a lovely cow, and but for a tiny patch of white on her brisket, would have acquitted herself well in any show. Worthy of notice are "Dominion Levuka," B70, by "Aviator," *ex* "Melanesia," and "Dominion Red Cuban," C112, by "Force Majeure," *ex* "Matuza."

Records made at Weraroa by Cows in the Present Red Poll Herd.

| Name of Cow. | Year Tested. | Fat Required for Certificate. | Days in Milk. | Milk Yield. | Butter Fat. | Age at Starting Test. |
|---|---|---|---|---|---|---|
| | | | | lb. | lb. | Years days. |
| Sylph .. .. | 1919–20 | 350·0 | 365 | 11009·00 | 505·84 | 5 4 |
| Sylph .. .. | 1921–22 | 350·0 | 303 | 10362·00 | 461·77 | 7 53 |
| Tablemount .. | 1919–20 | 350·0 | 310 | 11350·00 | 480·65 | 5 357 |
| Opticia .. .. | 1919–20 | 349·3 | 365 | 9958·50 | 441·27 | 4 343 |
| Opticia .. .. | 1920–21 | 350·0 | 337 | 10606·50 | 468·51 | 6 91 |
| Gold Top .. .. | 1919–20 | 307·2 | 365 | 9491·25 | 459·46 | 3 302 |
| Uralia .. .. | 1921–22 | 350·0 | 355 | 10253·10 | 424·97 | 5 57 |
| Neutral .. .. | 1919–20 | 272·7 | 365 | 9680·75 | 418·54 | 2 322 |
| Lallah .. .. | 1920–21 | 350·0 | 365 | 8227·30 | 370·56 | 6 65 |
| Dominion Eyrie .. | 1921–22 | 285·8 | 365 | 8338·70 | 370·48 | 3 88 |
| Matanga .. .. | 1920–21 | 350·0 | 346 | 8762·60 | 361·99 | 5 94 |
| Lucky Hit .. .. | 1919–20 | 269·1 | 318 | 8225·25 | 357·66 | 2 286 |
| Lucky Hit .. .. | 1920–21 | 301·0 | 346 | 7881·70 | 359·66 | 3 240 |
| Santa Anna .. .. | 1920–21 | 302·6 | 365 | 7782·80 | 354·71 | 3 256 |
| Dominion Riverina .. | 1920–21 | 271·1 | 342 | 7070·50 | 354·48 | 2 306 |
| Opticia .. .. | 1922–23 | 350·0 | 365 | 14569·30 | 605·09 | 8 41 |
| **Daughters of Red Poll Bull "Force Majeure."** | | | | | | |
| Dom. Silken Lashes .. | 1921–22 | 246·3 | 365 | 7229·60 | 382·36 | 2 58 |
| Dom. Morocco .. | 1921–22 | 243·9 | 365 | 9189·70 | 341·96 | 2 34 |
| Dom. Netherlana .. | 1921–22 | 244·0 | 365 | 7008·40 | 331·26 | 2 35 |
| Dom. Briar Rose .. | 1921–22 | 240·5 | 324 | 6884·20 | 315·24 | 1 351 |
| Dom. Red Cuban .. | 1921–22 | 240·5 | 340 | 6613·50 | 292·09 | 1 314 |
| Dom. Tabletop .. | 1922–23 | 240·5 | 320 | 8306·00 | 357·14 | 1 358 |
| Dom. Golden Flower .. | 1922–23 | 283·5 | 300 | 7993·80 | 322·99 | 3 65 |
| Dom. Suvla Bay .. | 1922–23 | 245·2 | 356 | 6856·30 | 290·76 | 2 47 |
| **Daughters of Red Poll Bull "Aviator."** | | | | | | |
| Dom Sylvana .. | 1921–22 | 246·3 | 326 | 8133·20 | 359 73 | 2 58 |
| Dom. Sulphide .. | 1923–24 | 240·5 | 341 | 8651·10 | 430.74 | 1 339 |
| Dom. Ruapehu .. | 1923–24 | 279·4 | 333 | 7735·10 | 335.02 | 4 24 |

It has been decided not to keep more than 40 cows in the milking herd at Weraroa, it having been found by experience that a larger number in one herd tends to lessen the milk production in the aggregate. Hence from time to time it is possible to offer a number of females for sale, which are eagerly snapped up by breeders. The Friesian cattle are located apart from the Red Polls in another part of the farm, and the Friesians are milked first. Milking is done by machinery, and starts at 3 a.m., the milking shed attendants knocking off at 7 a.m., and start work again at 3 p.m., and go home to tea when work is done. These hands are mostly lads, and to judge by their rather pale complexions, the doubt arises in one's mind whether the attractions of picture shows, dances, football matches, &c., enable them to secure the proper modicum of sleep.



**Opticia.**

When one reads the milk records of the herds and learns how little extra food is supplied beyond the grass and clover in the pastures, one can realize how much is due to top dressing with phosphate manures. Practically every variety of phosphate of lime has been tried at Weraroa at some time or another, and the quantities applied being liberal —from two to three coats frequently repeated. On one paddock comparative demonstration trials are being carried out, and not much difference is apparent in the results obtained from superphosphate, basic slag, or Ephos phosphate (from Egypt), though on the strip of land top dressed with lime before applying superphosphate, a deeper tinge of green is noticeable in the grass; but on land dressed with lime only and no phosphate the grass was distinctly yellower in colour. However,

a strip of land dressed only with a layer of crushed seashells seemed to be left severely alone by the stock. It is really not easy to tell by the eye only which strip is the best, owing to the universal presence of white clover; but the behaviour of the stock on the paddock demonstrates conclusively the increased palatability of the phosphated grass. As regards the best variety of phosphate to use on grass land, all are good, but some seem to act quicker than others, and the rapidity depends on local conditions of soil and rainfall. It has been shown that phosphate of lime does not leach out by rain, and it does not sink below the top 6 inches of the soil. Australian soils contain about half the amount that is present in average British soils, so there is no likelihood of catching up to the phosphate content of pastures at home for some years to come, even where 1 cwt. of superphosphate and 1 cwt. of ground

**Dominion Sylvanus, by Aviator *ex* Sylph.**

(Born 26.8.22.)

bones are applied yearly, as is done near Hamilton, New Zealand, on some heavily stocked paddocks. The benefit of top dressing appears to be cumulative, for there seems to be no limit to which the depth of humus may not be increased by it, even on most unpromising grey soils.

At Weraroa, Cocksfoot seems to predominate in all the pastures, and then Perennial Rye Grass, Cowgrass, Alsike, and White Clover are thick, also Crested Dogstail, and in places Meadow Foxtail and Meadow Fescue were seen, and occasionally the Poas or Meadow grasses. Timothy is regularly sown, but seems to be eaten out almost at once, and Prairie grass is present in the corners and edges of the paddocks. Where the cows are grazed almost exclusively there were plenty of Docks, but these were absent from the sheep paddocks. In laying down

land to grass after cropping the following grass and clover seed mixture is sown in spring:—Perennial Rye grass, 15 lb.; Italian Rye grass, 10 lb.; Cocksfoot, 3 lb.; Timothy, 4 lb.; Dogstail, 1 lb.; Cowgrass, 4 lb.; Alsike, 2 lb.; White Clover, 2 lb.; total—41 lb. of seed sown along with 2 cwt. of superphosphate per acre.

During the present season the following crops are being grown on the farm:—

(1) Sixteen acres Algerian oats, sown 3 bushels seed, with 3 cwt. superphosphate per acre.

(2) Three acres potatoes, varieties, "Vitality," "Maori Chief," "Up-to-Date," planted with superphosphate, 3cwt.; bone dust, 1 cwt.; dried blood, 1 cwt. per acre.

(3) Four acres black skinless barley, sown 2½ bushels seed, with 1 cwt. superphosphate per acre.

(4) Ten acres wheat, "Major" and "Solid White Tuscan," 2½ bushels seed, with 2 cwt. superphosphate per acre.

**Tablemount.**

(5) Four acres horse beans, 3 bushels seed per acre, without manure.

(6) One acre Rye corn, 2 bushels seed, with 1 cwt. superphosphate per acre.

(7) Three acres, oats and tares, 1½ bushel oats, 1 bushel tares, with 1 cwt. superphosphate per acre.

(8) One and a half acres peas, 3 bushels seed, with 3 cwt. superphosphate per acre.

(9) Eleven acres swedes, varieties, "Superlative," "Crimson King," and "Champion," sown with 3 cwt. superphosphate, and 1 cwt. blood and bone per acre.

(10) Seven acres, mangolds, varieties, "Jersey Queen," "Prize-winner," and "Long Red," sown with 3 cwt. superphosphate, and 1 cwt. blood and bone per acre.

(11) Four acres soft turnips, varieties, "Imperial Green Globe," "Red Paragon," and "White Pomeranian," sown with 3 cwt. superphosphate, and 1 cwt. blood and bone per acre.

(12) Four acres "Hickory King" maize.

(13) Two acres "White Belgian" carrots, sown with 3 cwt. superphosphate per acre.

The clover that stands out as the most valuable in New Zealand pastures is the white, of which there are many strains, some of them wild or semi-wild, with central tap roots and rootlets descending from the branches. A leafy strain has been isolated at Weraroa, which grows true to type, but in general New Zealand Commercial White clover is quite well worth while planting in most parts of Victoria. While top dressing

**Dominion Zeeland, by Dominion Sylvan, ex Dominion Netherlana.**
(Born 11.11.23.)

it is easy to sprinkle a handful on top of each bag of fertilizer as it goes into the spreader. The seed has great vitality, and will lie dormant in the soil for years, but it must have the stimulus of phosphate of lime to bring it to life, then as it spreads in the pasture it improves the nitrogen content of the soil, and causes better grasses to appear and persist. It has the advantage of being fertilized by the ordinary hive bee, and the use of the tripod chain harrow over the pastures will further diffuse the seed.

It is the policy of the farm to cull the herds severely, especially the bull calves, whereby breeders are assured that when they buy them they are getting those descended from high-producing cows. The farm maintains herds of Berkshire, large black and large white pigs, who received the skim which is pumped straight from the separator to the pig troughs.

The sheep on the farm consist of 1,000 breeding ewes, mostly Lincoln and Romney cross, which are joined with South Down rams, for raising fat lambs.

The buildings are large and commodious. The calf pen is fitted with small bails, made of iron piping, and all calves are bailed up for feeding with milk; consequently all are handled from the first, and no breaking in to the bail is ever required with the heifers when they come in. The milking shed is a lofty building, with too much dead space up above, which could be used as a hay loft, and this had to be netted in to keep out the sparrows. Bails are made of iron piping, with a concrete floor, and a tramway track runs down the centre for taking the milk from the cows, and the milk of each cow is at once weighed on the tramway truck. The track is continued out to the calf pen for conveying milk to the calves.

The garden is a lovely sight, and on plots varieties of every known grass are being tried. The farm is under the guidance of Dr. C. J. Reakes, the Director of the New Zealand Department of Agriculture, with Mr. J. F. Shepherd as manager. Mr. Jas. Stevenson is the live-stock overseer, and Mr. W. A. Wards the agricultural overseer, while Mr. V. H. F. Green is the secretary, and on him devolves much of the statistical work.

The Weraroa farm is one of the several maintained by the New Zealand Government in the North Island, the others being Ruakura farm, near Hamilton, on the Waikato; Moumahaki, in Taranaki; and Waerenga, near Gisborne. The value of these farms cannot be over estimated as a means of diffusing information gained from the constant working out of experiments. For instance, at Ruakura, where Paspalum grass has been tried, the earth soon became sod bound, but the combination with Subterranean clover produced excellent results, the clover forcing its way between the tufts and opening them up, and checking the formation of a twitch. It may be that this is the best mission of the Subterranean clover, for it has manifest defects, one being that it dies down in hot weather, leaving bare spaces in a turf; then its long tough running stems, which are rather scantily covered with leaves, generally miss the mower knife and entangle in the teeth of the hay rake, and so make the plant anything but desirable in a paddock that is mown for hay.

## COST OF FEEDING A GOOD DAIRY COW.

*By A. J. Gill, Dairy Supervisor.*

Many people contend that it does not pay to feed concentrates to a dairy cow, and when mention is made of any high yields given by herd-test cows, they ask, "How much did it cost?" The reply to this question is contained in the following tables of the cost of feeding two of the highest producers in the Government Herd Test. The lesson is obvious. A few good cows properly fed will give larger profits than a number improperly fed.

Table I.—Showing cost of feed of Jersey cow, **Babs of Somerville** (estimated live weight 1,000 lb.), during the Standard Herd Test 1924-25, and the value of the yield during the same period.

Milk, 15,779 lb. Test, 5.34%. Butter-fat, 843.77 lb.

| Food. | Weight in lb. | Contents in lb. | | | Cost. |
|---|---|---|---|---|---|
| | | Protein. | Carbo-Hydrates. | Fat. | |
| | | | | | £ s. d. |
| Bran .. .. | 1,924 | 215·48 | 811·92 | 48·10 | 5 3 0 |
| Polly feed .. .. | 1,289 | 180·46 | 670·28 | 25·78 | 3 14 10 |
| Crushed oats .. .. | 122 | 11·22 | 57·70 | 5·12 | 0 12 3 |
| Linseed meal .. .. | 398 | 103·87 | 153·23 | 25·87 | 2 2 8 |
| Oil cake .. .. | 56 | 9·18 | 23·63 | 5·09 | 0 5 6 |
| Lucerne chaff .. .. | 162 | 19·92 | 59·94 | 2·59 | 0 8 9 |
| Oaten chaff .. .. | 1,301 | 58·54 | 568·53 | 19·51 | 2 15 3 |
| Mangels .. .. | 2,500 | 27·50 | 135·00 | 2·50 | 2 4 8 |
| Total .. | 8,752 | 626·17 | 2,480·23 | 134·56 | 17 6 11 |

| | Protein. | Carbo-Hydrates. | Fat. | Cost. |
|---|---|---|---|---|
| | lb. | lb. | lb. | £ s. d. |
| Amounts required for milk production | 884·744 | 4,471·117 | 309·66 | .. |
| „ „ „ sustenance | 191·100 | 2,184·000 | 27·30 | .. |
| Total .. .. .. | 1,075·844 | 6,655·117 | 336·96 | .. |
| Amounts supplied to cow in bails .. | 626·170 | 2,480·23 | 134·56 | 17 6 11 |
| „ acquired from pasture . . . | 449·674 | 4,174·887 | 202·40 | 3 18 0 |
| Salt .. .. .. .. .. .. .. .. | | | | 0 3 9 |
| Total cost .. .. .. .. .. .. | | | | **21 8 8** |

In order to obtain the required nutrients from the pasture, it would be necessary for the cow to consume 80 lb. daily, containing 2.06 per cent. protein, 19.2 per cent. carbohydrates, and .92 per cent. fat.

| | |
|---|---|
| Value of 843.77 lb. of butter-fat, at 1s. 6d. a lb. .. | £63 5 7 |
| Value of 1,421.9 gallons of separated milk, at 2d. per gallon .. .. .. .. .. | 11 16 11 |
| Total .. .. .. | 75 2 6 |
| Cost of food .. .. .. .. .. | 21 4 11 |
| Profit .. .. .. | **£53 17 7** |

The average weight of food given in bails daily was 32 lb.

Good pasture, valued at 2s. per week.

One-tenth of milk allowed for cream in arriving at the weight of separated milk.

Table II.—Showing cost of feed of Ayrshire cow, **Poppy of Ben Kell** (estimated live weight 1,100 lb.), during the Standard Herd Test 1924-25, and the value of her yield during the same period.

Milk, 12,879 lb. Test, 5.37%. Butter-fat, 692.23 lb.

| Food. | Weight in lb. | Contents in lb. | | | Cost. |
|---|---|---|---|---|---|
| | | Protein. | Carbo-Hydrates. | Fat. | |
| | | | | | £ s. d. |
| Bran .. .. .. | 2,170 | 243·04 | 915·740 | 54·25 | 5 16 3 |
| Oaten chaff .. .. | 1,688 | 75·96 | 737·656 | 25·32 | 3 11 8 |
| Meggitts meal .. | 410 | 107·01 | 157·850 | 26·65 | 2 19 7 |
| Pollard .. .. | 236 | 28·79 | 126·024 | 8·96 | 0 14 10 |
| Gristed barley .. .. | 150 | 14·40 | 95·250 | 3·15 | 0 10 0 |
| „ beans .. .. | 50 | 11·05 | 22·050 | 0·60 | 0 10 0 |
| „ peas .. .. | 65 | 12·61 | 32·435 | 0·65 | 0 7 9 |
| „ oats .. .. | 240 | 22·08 | 113·520 | 10·08 | 1 4 0 |
| „ wheat .. | 16 | 2·19 | 7·616 | 0·22 | 0 1 4 |
| Lucerne chaff .. | 70 | 8·61 | 25·900 | 1·12 | 0 3 9 |
| Total .. | 5,095 | 525·74 | 2,234·041 | 131·00 | 15 19 2 |

| | Protein. | Carbo-Hydrates. | Fat. | Cost. |
|---|---|---|---|---|
| | | | | £ s. d. |
| | lb. | lb. | lb. | |
| Amount required for milk production | 721·224 | 3,657·636 | 257·58 | .. |
| „ „ „ sustenance | 210·210 | 2,402·400 | 30·03 | .. |
| Total .. .. | 931·434 | 6,060·036 | 287·61 | .. |
| Amount supplied to cow in bails .. | 525·740 | 2,234·041 | 131·00 | 15 19 2 |
| „ acquired from pasture .. | 405·694 | 3,825·995 | 156·61 | 2 18 6 |
| Salt .. .. .. .. .. .. .. .. | | | | 0 2 0 |
| Lime .. .. .. .. .. .. .. .. | | | | 0 2 0 |
| Total amount .. .. .. .. .. .. | | | | 19 1 8 |

In order to obtain the required nutrients, it would be necessary for the cow to consume 80 lb. of pasture daily, containing 1.86 per cent. protein, 17.52 per cent. carbo-hydrates, .72 per cent. fat.

| | |
|---|---|
| Value of 692.23 lb. of butter-fat, at 1s. 6d. per lb. .. | £51 18 4 |
| Value of 1,159 gallons of separated milk, at 2d. per gallon .. .. .. .. .. | 9 13 2 |
| Total .. .. .. | 61 11 6 |
| Cost of food .. .. .. .. .. | 19 1 8 |
| Profit .. .. .. | £42 9 10 |

Fair pasture, valued at 1s. 6d. per week.
The average weight of food given in bails daily was 18.66 lb.
One-tenth of weight of milk deducted to allow for cream.

# RUPANYUP CROP AND FALLOW COMPETITIONS, 1924.

*Report of the Judge, J. E. Harrison, B.Ag.Sc.; Science Field Officer.*

At the time of judging, the Rupanyup district gave great promise of a good harvest from Murtoa to Marnoo. No crop that would not pay for rent or interest, seed, manure, and labour was noticed. Occasionally wild oats and thistles marred some crops, while white patches in many indicated that "take-all" and "dead-heads" were taking their inevitable toll.

Farming methods have reached a high standard in the district, particularly in thorough cultivation and heavy manuring. From the prevalence of "dead-heads" and "take-all," it would appear that an oat crop could be grown with profit more frequently in rotation with wheat and fallow. Several times, growers were found growing two, and even three, crops of oats in succession on the same land, and the desirability of growing the oat crop on different land each year is pointed out. Another practice open to improvement in some cases is the selection and grading of seed, care not always being exercised. Some years since, the Wyuna State Farm carried out experiments with graded and ungraded seed with the following result:—

| Plot. | Yield per acre. |
|---|---|
| Normal seed (direct from harvester) .. | 25 bushels 27 lb. |
| Grade No. 1 .. .. .. | 28 bushels 6 lb. |
| Grade No. 2 .. .. .. | 27 bushels 53 lb. |
| Grade No. 3 .. .. .. | 23 bushels 50 lb. |

Again, after a series of tests lasting five years, selected Federation was found to give an increase of 5.8 bushels per acre over ordinary Federation. It will be seen, then, that selection and grading are practices that pay.

## Two Weeds.

Weeds are a feature that demand special remark, and, in fact, the spread of hoary cress, *Lepidium draba,* in the district should be viewed with concern. It is appearing along channels, and is being distributed in the fields by cultural operations. A wise practice is to avoid cultivating any patches of land where it appears, and the possibility of smothering the weed with several feet of straw available from the crop alongside could be profitably tried out. A full account of this weed will be found in this *Journal* for January, 1923.

Another pest making its appearance is the Cow or Bladder Soapwort, *Saponaria vaccaria,* ironically known in the district as the South Australian cabbage. Because of its habit of breaking off near the ground and remaining caught in the comb, the harvester regards it at least as a source of annoyance, if not one of great loss. This weed will multiply from year to year if it is not pulled up or cut down before the weeds mature, piled, and burnt. Hoeing when the plant is young would probably be the most efficient means of eradication.

## Results.

Section 1: Brunton Cup, 2nd Year.—The Whole of the Wheat Crop for 1924 to be Judged.

This is the second year of the competition for the Brunton Cup, and the crops of nine farms were inspected. Messrs. W. J. & G. H. Hemphill and Mr. F. E. Lanagan tied for first place, with 93 points each.

Part of the total crop in each case was uniform and heavy, while a portion was on the light side. Taken as a whole, however, the crops promised good yields, were relatively free from weeds and disease, and uniform for large areas.

Messrs. W. J. & G. H. Hemphill exhibited 330 acres of crop, of which the best was a 90-acre field described under section 2 for the best 60-acre crop. All had been summer-fallowed except a small area of 40 acres, in which wild oats were prevalent. The remainder was given the cultivation similar to the 90-acre field above referred to, and detailed under section 2.

**Second Prize Crop—Section 2.—Messrs W. J. and G. H. Hemphill's crop of Federation (sixty acres.)**

Mr. F. E. Lanagan submitted 150 acres of Federation, consisting of 90 acres in one paddock, and 60 acres in another. The larger paddock was growing a splendid crop of bright, healthy wheat, fairly dense, clean, well-headed, level, and ripening uniformly throughout. The paddock was in oats in 1920, and this is the second wheat crop grown since then. At the time of inspection, it was remarkably free from "take-all" and "dead-heads." The land was summer-fallowed the previous year. It was ploughed with the set plough in March and April, skim ploughed after cropping, harrowed, and subsequently given four scarifyings before sowing with a 3½-inch "combine" in June, at the rate of 95 lb. seed and 100 lb. of 22 per cent. superphosphate to the acre. The second paddock of 60 acres was disappointing by comparison, being a winter fallow, and having had no oat crop for many seasons. As a result, the wild oats were standing out plainly, patches of "dead-heads" occurred here and there, and the yield appeared much lighter. The two fields were separated by a channel only, and presented

a most interesting comparison of the value of early fallow and crop rotation on the one hand, and, on the other, the cost of late cultivation and cropping with wheat only. It is another instance, in fact, of the essential relationship between farming methods and business methods.

Mr. R. J. Jackson's crop consisted of 225 acres of Federation, excellent wheat for the most part, remarkably clean underfoot, and even throughout. All but 30 acres had been summer-fallowed. One field of 173 acres was wheat all through, free from weeds, and little affected by disease. Another of 52 acres was affected with "dead-heads" on a black flat, but on lighter land on the hillside very little disease was noticeable. This paddock, moreover, had been in oats for two years, but had lain out a year before being fallowed and cropped. It is well known that barley grass, and many other grasses can carry the disease over from season to season, but the occurrence of "dead-heads" after two oat crops is unusual. Several different fungi are known to cause "dead-heads," some of which affect oats, and it is hoped that the micro-

**A crop of Major (Mr. J. P. Loats'.)**

scopical identification of the disease in Mr. Jackson's crop may throw some light on the problem that has arisen.

A crop of 600 acres was exhibited by Messrs. C. Carra & Sons, and the yield should be good over the whole area, though parts were diseased. One field of 150 acres on new ground looked particularly healthy, well-headed, and true to type. A commendable feature for such a large acreage was its trueness to type and its relative freedom from weeds.

Mr. E. T. Kendell presented 150 acres for inspection. The land had all been summer-fallowed, being scarified and harrowed in March and April, skim-ploughed 2½ to 3 inches deep in July and August, harrowed four times, scarified in October, and subsequently harrowed five times before sowing with the "combine" at the end of June with 140 lb. superphosphate, and 80 to 90 lb. of seed. Two harrowings were given after sowing. The crop was heavy, but rather tall, and wild oats somewhat marred its appearance.

Of the remaining entries, 100 acres of Wannon exhibited by Mr. J. Crampton is worthy of special mention, as a clean, level, well-headed

crop. In one paddock of uniform soil, Mr. J. P. Loats had 10 acres of Wannon, 11 acres of Federation, and 14 acres of Major, all sown under the same conditions. The land had previously been in oats, and the varieties of wheat all looked very promising. Mr. Loats is to be complimented on his experimental methods, and may expect some interesting comparative yields. Both Mr. J. Chapman and Mr. A. Chapman were unfortunate in each having a large paddock badly affected with "dead-heads" and weeds, resulting in a heavy deduction from their total scores.

### Details of Award—Section 1: Brunton Cup.

For the whole of the wheat grown 1923, 1924, and 1925, and limited to competitors growing at least 100 acres annually.

| Name. | Yield. | Type. | Absence of Weeds. | Absence of Disease. | Evenness. | Allowance for Refractory Red Soil. | Total, 1924. | Total, 1923-4. |
|---|---|---|---|---|---|---|---|---|
| **Possible Points ..** | **35** | **20** | **15** | **15** | **15** | .. | **100** | **200** |
| W. J. and G. H. Hemphill | 35 | 18 | 13 | 13 | 14 | .. | 93 | 178 |
| F. E. Lanagan .. | 35 | 18 | 13 | 13 | 14 | .. | 93 | 178 |
| R. J. Jackson .. | 32 | 18 | 14 | 13 | 14 | .. | 91 | 169 |
| C. Carra and Sons | 32 | 19 | 13 | 13 | 13 | 1 | 91 | 174 |
| E. T. Kendell .. | 34 | 18 | 13 | 12 | 14 | .. | 91 | 178 |
| J. Crampton .. | 32 | 18 | 13 | 12 | 14 | .. | 89 | 182 |
| J. P. Loats .. | 32 | 18 | 13 | 12 | 14 | .. | 89 | 173 |
| Jas. Chapman .. | 27 | 18 | 12 | 12 | 14 | .. | 83 | 168 |
| Alf. Chapman .. | 26 | 18 | 12 | 9 | 14 | .. | 79 | 159 |

### Section 2.—Best 60 Acres.

Excellent crops were exhibited under this section. In the eighteen entries, some very weighty crops were included, and even the lightest promised a very profitable yield.

Mr. R. J. Jackson gained first place with 97 points. The exhibit consisted of the best of the paddock of 173 acres mentioned under section 1. It was remarkably even, clean, and well headed. The land had been summer-fallowed, and sown in the latter half of June with 90 lb. of graded seed and 1 cwt. of 22 per cent. superphosphate.

Messrs. W. J. and G. H. Hemphill's entry consisted of a dense, level crop grown on uniform black land. Rust was somewhat in evidence, and a few strangers stood out, but there were no weeds. The land had been skim-ploughed and harrowed in the autumn, skim-ploughed again at the end of August, and harrowed twice, scarified in late September, and subsequently scarified and harrowed, spring-toothed and harrowed, and scarified again before sowing in July with 95 lb. seed and 1 cwt. of 22 per cent. superphosphate. The crop was particularly attractive for its evenness and yield.

Messrs. C. Carra & Sons showed a dense, if rather uneven, crop of Federation, well filled and weighty, and true to type. Messrs. Miller Brothers' crop (*a*) of improved Federation was one of the heaviest inspected; it was true to type, but affected somewhat with rust and a few "dead-heads" were present. It was a late crop sown at the beginning of August, on a well-cultivated summer fallow, at the rate of 85 lb. of graded seed and 120 lb. of 22 per cent. superphosphate. Crop

(*b*) was being watched with interest in the district. It was sown the first week in September on a good winter fallow at the rate of 160 lb. of manure and 100 lb. of seed per acre. At the time of inspection the grain was in the early milky stage, and the best portion of the crop promised well. It had traces of rust, however—not an unusual feature in late crops this year—and the harvest could be predicted with no certainty. Mr. J. P. Loats exhibited 60 acres, comprised partly of Major and partly of Federation, growing on similar soil, and the yields from the respective varieties will make an interesting comparison. The same may be said of Mr. E. T. Kendell's two crops of Federation and Wannon, while Mr. D. Jones's crop deserves special mention because of its trueness to type. Here credit is reflected as well upon the Longerenong Agricultural College, this institution having supplied the seed.

DETAILS—SECTION 2—BEST 60 ACRES OF WHEAT.

| Name. | Yield. | Trueness to Type. | Absence of Disease. | Absence of Weeds. | Evenness. | Total. |
|---|---|---|---|---|---|---|
| **Possible Points ..** | **35** | **20** | **15** | **15** | **15** | **100** |
| R. J. Jackson .. | 34 | 19 | 14 | 15 | 15 | 97 |
| W. J. and G. H. Hemphill | 35 | 18 | 13 | 15 | 15 | 96 |
| C. Carra and Sons .. | 35 | 19 | 14 | 14 | 13 | 95 |
| Miller Bros.(*a*) .. | 35 | 19 | 13 | 14 | 14 | 95 |
| J. P. Loats .. .. | 34 | 19 | 13 | 14 | 14 | 94 |
| Sprake Bros. .. | 34 | 17 | 14 | 14 | 14 | 93 |
| G. L. Cromie .. | 31 | 19 | 13 | 14 | 14 | 91 |
| F. Nicholson .. | 34 | 18 | 13 | 12 | 14 | 91 |
| J. Crampton .. | 30 | 18 | 14 | 13 | 15 | 90 |
| J. A. Phillips .. | 29 | 19 | 13 | 14 | 15 | 90 |
| A. Chapman .. | 30 | 18 | 13 | 13 | 15 | 89 |
| D. Jones .. .. | 29 | 20 | 10 | 14 | 15 | 88 |
| Miller Bros.(*b*) .. | 29 | 19 | 13 | 13 | 14 | 88 |
| E. T. Kendell (*b*) .. | 28 | 18 | 13 | 12 | 14 | 85 |
| J. Chapman .. .. | 23 | 18 | 14 | 14 | 15 | 84 |
| T. Hines .. .. | 26 | 18 | 12 | 14 | 14 | 84 |
| E. T. Kendell (*a*) .. | 26 | 18 | 13 | 13 | 14 | 84 |
| D. N. McLennan .. | 25 | 17 | 14 | 14 | 14 | 84 |

SECTION 3.—FALLOW COMPETITION.

Light fallows inspected under section 3 of the competition were very difficult for the most part to separate on their merits. In fact, only by attention to small points could distinctions be made, and exhibitors generally may feel gratified as to the excellence of their fallows.

Of the eight entries under section 3, one was a winter fallow, three a combination of both summer and winter fallows, and four summer fallows. The practice of summer-fallowing is extending, and since in a farming community, practice is founded on experience only, we may regard the value of early fallowing as proved. In other words, it has been found a paying proposition.

Occasional crops inspected had been grown on two years' fallow. Although the grower sometimes regarded the crop as slightly better than usual, it was not general to find any improvement in the yield, and sometimes, in fact, the crop was regarded as below standard. Possibly

quantities of plant food were washed out of the soil by the winter rains after the first year, and, as a result, the final accumulation of plant food in the second year may not have been much different from the first year. As far as soil moisture is concerned, it is likely that if cultivation were continuous there would have been an increase in the second year over the amount present in the first year. If, however, the fallow were neglected between the first and second years, the loss of moisture by evaporation would have been considerable, and the amount of moisture conserved might be no greater in the second year than the first year.

These few suggestions are offered because the subject was found to be one of discussion in the district.

First place was gained by Mr. D. Jones with 98 points. A uniform area of 170 acres of black land was exhibited in excellent condition. It was comprised of two paddocks, one of 80 acres, which area had been under oats the year before, and one of 90 acres, which had been cropped

**Crop of Federation at Mr. Hines', Marnoo.**

with oats for the two years previous. The whole area had been set-ploughed in March to a depth of from 3 to 4 inches, scarified 2½ inches deep, and harrowed in May, and subsequently scarified four times and harrowed after each scarifying. A fine mellow mulch 2½ inches deep overlay a very level, firm seed bed, plentifully supplied with moisture. As a fallow, it reflected the skill and judgment of the operator, Mr. R. Wallace, in the use of his implements, and because of the crops of oats that have just preceded the fallow, Mr. Jones expects a crop next season free from the "take-all" and "dead-heads" that decimated his crop this season.

Messrs. Brown Brothers gained second place with 96 points for 180 acres of fallow on land more variable in nature. An almost equal amount of cultivation had been given, commencing with the set plough, 3½ inches deep, in March-April. Scarifying and harrowing were done in May, and again in July, when a cross-harrowing was also given. The drag harrows were run over the land in September-October, and a scarifying given in November, and finally a harrowing in December.

Messrs. W. G. and G. H. Hemphill and Mr. J. P. Loats tied for third place with 95 points. The fallows in both instances were well worked and even, and the few points lost mattered only probably from a competition stand-point. The remaining fallows were generally good, but lacked the finish which must be taken into account when the prize is so keenly contested. An extra cultivation was required in some instances, while occasionally the presence of a few thistles indicated that a mattock had remained a day too long in the corner of the shed.

Details of Award—Section 3: Best Fallow (Half of Fallow for Season 1924).

| Name of Competitor. | Moisture. | Mulch. | Cultivation. | Absence of Weeds. | Total. |
|---|---|---|---|---|---|
| Maximum Points .. .. | 25 | 25 | 25 | 25 | 100 |
| D. Jones .. .. | 25 | 24 | 25 | 24 | 98 |
| Brown Bros. .. .. | 25 | 23 | 24 | 24 | 96 |
| W. G. & G. H. Hemphill .. | 25 | 24 | 23 | 23 | 95 |
| J. P. Loats .. .. | 25 | 23 | 23 | 24 | 95 |
| R. J. Jackson .. .. | 25 | 22 | 23 | 24 | 94 |
| D. N. McLennan .. .. | 25 | 23 | 23 | 23 | 94 |
| Carra & Sons .. .. | 24 | 23 | 21 | 24 | 92 |
| J. P. Sweetman .. .. | 24 | 22 | 21 | 23 | 90 |

**Commodious Stables on Mr. R. J. Jackson's Property.**

Section 5: Soldiers' Wheat.

Three entries were judged in this section, the winner being Mr. F. Nicholson, who gained 92 points for an excellent crop of 75 acres of Federation on summer fallow. The land had been scarified in March, set-ploughed in August, harrowed twice, scarified in September, harrowed four times, and subsequently scarified three times before sowing at the end of June with 105 lb. of graded seed and 130 lb. of 22 per

cent. superphosphate. In spite of regular cultivation, weeds had made their appearance in an otherwise creditable exhibit.

Mr. E. T. Kendell, who gained 87 points, presented a very similar though lighter crop of 150 acres, consisting partly of Federation and partly of Wannon, all on summer fallow that had been worked equally well. The Wannon appeared to be less affected than the Federation with "dead-heads," and was rather more promising.

Neither of the above exhibitors had been able to run sheep on his fallow, and both were less successful in keeping weeds out of their crops than Mr. A. G. Swan, who runs about 50 sheep, and grows very clean crops. Mr. Swan, unfortunately, had one field badly affected with "dead-heads" on the black soil, but curiously enough on grey soil in the same field there was no disease. This is probably explained by the high lime content of the black soil as compared with the grey soil, and by the propensity of the fungus causing the disease for soils rich in lime.

**A Soldier's Crop. (Mr. A. G. Swan's, Warranooke.)**

Section 5: Soldiers' Wheat.

| Name. | Yield. | Trueness to Type. | Absence of Weeds. | Absence of Disease. | Evenness. | Total. |
|---|---|---|---|---|---|---|
| **Possible Points** .. | **35** | **20** | **15** | **15** | **15** | **100** |
| F. Nicholson ... | 35 | 18 | 12 | 13 | 14 | 92 |
| E. T. Kendell .. | 30 | 18 | 12 | 13 | 14 | 87 |
| A. G. Swan .. .. | 27 | 18 | 14 | 11 | 14 | 84 |

Section 6: Soldiers' Fallow.

There were but two entries in this section, and both were highly commendable for the cultivation that had been given them.

Mr. R. W. Bywaters gained first place with 95 points for a fallow that had received twelve workings all told, consisting of a ploughing, three scarifyings, six harrowings, and two cultivations with the "combine." Various soils occurred in the fallow from typical black land to rather harsh grey and red soils. Some new loose land had been cleared on a flat, and broken down with the plough, scarifier, and harrows. Mr. Bywater's industry and enterprise were also reflected in his home-built stables, a stud stallion, an iron fence for his hay-stack, and a small piggery. On a small area, the soldier settler needs some such sidelines.

Mr. F. Nicholson's fallow of 100 acres consisted for the most part of uniform black soil that lent itself readily to cultivation, and was in excellent condition. In the opinion of the judge, the mulch, though fine in texture, was on the shallow side, being just less than 2 inches deep. A small area of late fallow was not in such good order.

Details of Award—Section 6: Soldiers' Fallow.

| Name of Competitor. | Moisture. | Mulch. | Cultivation. | Absence of Weeds. | Total. |
|---|---|---|---|---|---|
| **Maximum Points** .. .. | **25** | **25** | **25** | **25** | **100** |
| R. W. Bywaters .. .. | 24 | 23 | 24 | 24 | 95 |
| F. Nicholson .. .. | 24 | 23 | 22 | 23 | 92 |

# EXPERIMENTS IN COOL STORAGE OF APPLES.

*By D. B. Adam, B. Ag. Sc., and J. E. Harrison, B. Ag. Sc.*

The question of scald in Jonathan apples was attacked experimentally in 1922, when various lots were stored at different temperatures, but, unfortunately, from an experimental point of view, no scald to speak of developed at any temperature, and no light was thrown on the problem.

In 1923 the experiment was repeated with two consignments of Jonathan apples received on different dates from Drouin, and stored, some at 32 degrees and some at 37 degrees F. The first consignment (unwrapped) was received on 22nd March, 1923. Two cases were placed in direct expansion chambers, one running at 32 degrees and the other at 37 degrees F., and a third case was placed beneath an inlet duct in a chamber cooled by a combination of the direct expansion and air circulation systems, and run at an average of 37 degrees F., being beneath the inlet duct the average temperature of the fruit was prob-

ably below 37 degrees F. An examination between four or five months later gave the following result:—

Table 1: Scald in Early Jonathan Apples at Different Temperatures.

| Temperature .. .. | 32 deg. | 37 deg. | 37 deg. |
|---|---|---|---|
| Cooling System .. .. | Direct Expansion. | Direct Expansion. | Direct expansion and air circulation. |
| Date of examination .. | 27th July. | 27th July. | 6th August. |
| Sound apples .. .. | 17 | 95 | 90 |
| Slight scald .. .. .. | 24 | 19 | 13 |
| Medium scald.. .. .. | 22 | 6 | 3 |
| Bad scald .. .. .. | 47 | 3 | 2 |
| Number of apples .. .. | 110 | 123 | 108 |

The second consignment was received on 17th April. Two cases were unwrapped, and one case was wrapped in oiled paper. One unwrapped case was stored in the direct expansion chamber at 32 degrees F., and the other unwrapped case and the case wrapped in oiled paper were stored in the direct expansion chamber at 37 degrees. An examination of the three cases was made on 27th July, with the following result:—

Table II.: Scald in Late Jonathan Apples.

| Temperature .. .. .. | 32 deg. | 37 deg. | |
|---|---|---|---|
| Wrapped or unwrapped .. | Unwrapped. | Unwrapped. | Wrapped. |
| Sound apples .. .. .. | 131 | 125 | 134 |
| Slight scald .. .. .. | 3 | 1 | 1 |
| Medium scald .. .. .. | 2 | 0 | 0 |
| Bad scald .. .. .. | .. | .. | .. |
| Number of apples .. .. | 136 | 126 | 135 |

From these results the following interesting observations are readily made:—

In Table 1, the development of scald in the case at 32 degrees F. appears greater than in either of the cases at 37 degrees F. (2) A comparison of the two tables shows that there was less scald in the Jonathans picked late than in the Jonathans picked early; and (3), in Table 2, it is shown that only one apple scalded in each of the cases stored at 37 degrees F., one unwrapped, and one wrapped in oil paper, and so no evidence was obtained as to the value of oiled wrappers in preventing scald in Jonathan apples.

Experiments were continued in 1924 with the object of testing afresh the effect of temperature, early and late picking, and the value of oiled wrappers. Rome Beauty apples, as well as Jonathan apples, were included in the experiments made.

## Effect of Oiled Wrappers in the Prevention of Scald in Jonathan and Rome Beauty Apples.

On 24th March, 1924, a grower from Drouin consigned three cases of Jonathan apples to the Government Cool Stores. The cases were immediately stored in a commercial chamber, running at 34 degrees F., until 3rd April, when they were distributed throughout the experimental chambers. The apples were wrapped half in oiled papers and half in plain tissue papers, and, upon examination on 26th June, gave the following result:—

Table III.: Showing Result of Test with Oiled Wrappers for the Prevention of Scald in Jonathan Apples.

| | 32 deg. F. | | 34 deg. F. | |
|---|---|---|---|---|
| | Oil. | Plain. | Oil. | Plain. |
| Sound .. .. .. | 36 | 27 | 41 | 32 |
| Slight scald .. .. | 13 | 16 | 13 | 13 |
| Medium scald .. .. | 12 | 15 | 8 | 17 |
| Bad scald .. .. .. | 13 | 20 | 6 | 17 |
| Breakdown .. .. | 3 | .. | .. | .. |
| Number of apples (2½″) .. | 77 | 78 | 68 | 79 |

A case of 2¼-inch Jonathan apples stored at 37 degrees F., examined at the same time, showed no development of scald in either paper.

A consignment sent by a second grower from Drouin on 31st March, 1924, and stored on the 2nd April, at 32 degrees F., was examined on 27th June, with the following result:—

Table IV.: The same.

| | Heavy oil paper. | Light oil paper. |
|---|---|---|
| Sound .. .. .. | 54 | 49 |
| Slight scald .. .. | 6 | 6 |
| Medium scald .. .. | 2 | 7 |
| Bad scald .. .. | 2 | .. |
| Size of apples .. .. | 2¾″ | 2¾″ |

On 29th July a further examination was carried out, which showed the development of scald a second time.

Table V.: The same.

| | Heavy oil paper. | Light oil paper. |
|---|---|---|
| Sound .. .. .. | 29 | 19 |
| Slight scald .. .. | 6 | 13 |
| Medium scald .. .. | 6 | 12 |
| Bad scald .. .. | .. | .. |

The remainder had broken down internally, and their number is not included.

Comparative lots of this second consignment were stored at 37 degrees F., but no scald had developed in these on 27th June, while on 29th July seven apparently slightly scalded apples were discovered in the lot wrapped in light oil paper. (The terms "heavy" and "light" refer to the relative amounts of oil contained in each paper.)

The consignment included also one case of 2¼-inch Jonathans, wrapped half in oil paper and half in plain paper, which was stored at 34 degrees F. No scald developed, however, in this case, or in two cases of 2½-inch apples, similarly wrapped, which were stored at 37 degrees F.

In addition to these experiments, carried out in the experimental chambers of the Government Cool Stores, various cool stores were invited to test for themselves the effect of oiled wrappers on scald in Jonathan apples. Experimental lots were wrapped and stored in commercial chambers of the various district cool stores, and examined after a period of about four months, in the presence of J. E. Harrison, with the following results:—

At Red Hill no scald developed in an experimental lot wrapped in oil paper and stored under usual commercial conditions.

At Hastings four cases were used in the test, two being wrapped in oil paper and two in plain paper. Following are results:—

Table VI.: The same.

| —— | Oil paper. | Plain paper. |
|---|---|---|
| 2¾″ Jonathans— | | |
| Sound .. .. | 43 | 60 |
| Scald .. .. | 89=67% | 84=58% |
| Number of apples .. | 132 | 144 |
| 2½″ Jonathans— | | |
| Sound .. .. | 74 | 90 |
| Scald .. .. | 99=57% | 85=48% |
| Number of apples .. | 173 | 175 |

At Ringwood a somewhat similar experiment with Jonathan apples was carried out, and a summary is given—

Table VII.: The same.

| —— | Oil. | Plain. | Unwrapped. |
|---|---|---|---|
| Sound .. .. .. | 181 | 166 | 62 |
| Scald .. .. .. | 73 | 85 | 66 |
| Number of apples .. | 254 | 251 | 128 |

In the above tables there are no constant differences between the results from the use of oiled wrappers and plain wrappers, and it is concluded that no benefits were derived this year from the use of oiled wrappers as a preventative of scald in Jonathan apples.

Sent at the same time as the Jonathan apples were several cases of Rome Beauty apples, of which the following report is made:—

A consignment of six cases, wrapped half in oil paper, and half in plain paper, was sent by a grower from Drouin on the 24th March, and stored in a commercial chamber at 34 degrees until 3rd April, when they were distributed throughout the experimental chambers. Examined on 1st July, these apples showed no signs of scald. They were examined again on 11th September, with the following result:—

TABLE VIII.: SHOWING RESULTS OF TESTS WITH OILED WRAPPERS FOR THE PREVENTION OF SCALD IN ROME BEAUTY APPLES.

| Temperature .. | 32 deg. | | | | 34 deg. | | | |
|---|---|---|---|---|---|---|---|---|
| Kind of paper .. | Oil A. | Plain. | Oil B. | Plain. | Oil A. | Plain. | Oil B. | Plain. |
| Size of apple .. | 3″ | 3″ | 3″ | 3″ | 2¾″ | 2¾″ | 3″ | 3″ |
| Sound .. .. .. | 46 | 42 | 39 | 18 | 23 | 22 | 25 | 10 |
| Scald .. .. .. | 2 | 1 | 2 | 24 | 26 | 34 | 11 | 39 |
| Breakdown .. .. | 5 | 7 | 13 | 9 | 15 | 7 | 8 | 4 |
| Mould .. .. .. | .. | .. | .. | .. | .. | .. | .. | .. |

| Temperature .. .. | 38 deg. | | | |
|---|---|---|---|---|
| Kind of paper .. .. | Oil A. | Plain. | Oil B. | Plain. |
| Size of apple .. .. | 3″ | 3″ | 3″ | 3″ |
| Sound .. .. .. | 35 | 23 | 40 | 16 |
| Scald .. .. .. | 4 | 26 | 10 | 31 |
| Breakdown .. .. | 2 | .. | 1 | 3 |
| Mould .. .. .. | .. | 3 | 4 | 2 |

Oil A—Heavily Oiled Wrappers. Oil B—Lightly Oiled Wrappers.

If a summary is made from this table in respect of oiled wrappers and plain wrappers, the following figures are obtained:—

| —— | Oil paper A. | Oil paper B. | Plain paper. |
|---|---|---|---|
| Sound .. .. .. | 104 | 104 | 131 |
| Scald .. .. | 32 | 23 | 155 |

These figures indicate that scald in Rome Beauty apples was inhibited to an extent by the use of oiled wrappers, but the evidence

cannot be regarded as conclusive because of variations in the results to which attention is now drawn. In Table VIII., in the column headed 32 degrees, it will be seen that one lot of apples wrapped in plain paper had only one apple scalded, while another lot similarly wrapped, and to all appearances equivalent to the first lot had 24 apples scalded. Again, in the same table in the column headed 34 degrees, it appears that the oiled wrappers had much less effect on the $2\frac{3}{4}$-inch apples than on the 3-inch apples. Evidently not all apples are equally susceptible to scald and it is clear that where irregular results are obtained conclusions can only be drawn from the average of a series of experiments.

## Effect of Temperature upon the Development of Scald in Jonathan and Rome Beauty Apples.

This aspect of the problem creates considerable interest in every quarter, and the results of the experiments relating to temperature are regarded very closely. As stated previously, experiments with Jonathan apples conducted in 1922 gave negative results, at all temperatures, while reference to Table 1 will show that, in 1923, less injury occurred at 37 degrees than at 32 degrees F. Several experiments were designed this season to obtain further results, but the difficulty of obtaining fruit similar in all respects was not easily overcome, and in one instance only were three cases of Jonathans obtained that were justly comparable. These were part of a consignment sent on 7th April, 1924, by a Drouin grower, and were in picking ripe condition. One case was stored at 32 degrees F., one at 34 degrees F., and one at 37 degrees F., all in direct expansion chambers, and upon examination on 25th June gave the following result:—

Table IX.: Showing Effect of Temperature on Development of Scald in Jonathan Apples.

| Temperature .. .. | 32 deg. | 34 deg. | 37 deg. |
|---|---|---|---|
| Size of fruit .. .. | 2⅛″ | 2½″ | 2½″ |
| Sound .. .. .. | 97 | 96 | 167 |
| Slight scald .. .. | 26 | 29 | .. |
| Medium scald .. .. | 25 | 28 | .. |
| Bad scald .. .. | 24 | 21 | .. |
| Internal breakdown .. | .. | .. | 5 |
| Number of apples .. | 172 | 174 | 172 |

These results are interesting as confirming those obtained in 1923, and point clearly to the occurrence of less scald at 37 degrees F. than at 32 degrees and 34 degrees F.

Reference is made again to Table IV., and to the comparative lots which were stored at 37 degrees F., as stated in Table V. The apples referred to were wrapped in oil paper and stored at 32 degrees

F., and 37 degrees respectively, with the following result. (No classification here being made between heavily and lightly oiled wrappers):—

Table X.: Showing Effect of Temperature on the Development of Scald in Jonathan Apples.

| Temperature .. .. .. | 32 deg. | 37 deg. |
|---|---|---|
| Size of fruit .. .. .. | 2¾″ | 2¾″ |
| Sound .. .. .. .. | 103 | 104 |
| Slight scald .. .. .. | 12 | 7 |
| Medium scald .. .. .. | 9 | .. |
| Bad scald .. .. .. .. | 2 | .. |
| Internal breakdown .. .. .. | 3 | 18 |
| Mould .. .. .. .. | 1 | 1 |
| Number of apples .. .. .. | 130 | 130 |

Here, again, less scald developed at 37 degrees than at 32 degrees in comparable lots. Unfortunately no similar lot was stored at any intermediate temperature, but from previous tables (Nos. III. and IX.) it will be seen that any difference in the results at 32 degrees F. and 34 degrees F. was not appreciable. In other instances apples stored at different temperatures differed in size, but in no case was the development of scald considerable at the higher temperatures.

Apart from our experimental results with Jonathan apples, we are glad to make mention of the trial in one chamber of the Harcourt Cool Stores of a storage temperature of 35-37 degrees F., for Jonathan apples in particular, and of the success which attended the trial. The best confirmation of this success is the decision of the growers who rented the chamber to continue to run it at this temperature.

It is emphasized that these indications of the desirability of a higher temperature for the prevention of scald refer so far only to the Jonathan apple. If we summarize the results for the various temperatures in Table VIII. to discover the effect of temperature on the development of scald in Rome Beauty apples we obtain the following table:—

Table XI.: Showing the Development of Scald in Rome Beauty Apples at Different Temperatures.

| Temperature .. .. | 32 deg. | 34 deg. | 37 deg. |
|---|---|---|---|
| Sound .. .. .. | 145 | 80 | 114 |
| Scald .. .. .. | 29 | 170 | 71 |
| Breakdown .. .. | 34 | 34 | 6 |
| Mould .. .. .. | .. | .. | 9 |

Note.—Since approximately equal quantities of apples wrapped in oil paper and in plain paper were stored at each temperature, only the total number for each temperature is considered.

Nothing conclusive can be derived from this table, as the apples stored at 34 degrees F. were not all comparable with those stored at 32 degrees and 37 degrees. The apples stored at 37 degrees, however, were regarded as similar to those stored at 32 degrees, and the occurrence of scald was worse at the higher temperature. This supports the demonstration made in 1922. (See *Journal of Agriculture*, Vol. XXI., page 236.)

Further evidence of the effect of temperature on the occurrence of scald in Jonathan and Rome Beauty apples can only be gained year by year, but the interesting point now is that the evidence to date shows that in Jonathan apples scald occurs less at 37 degrees F. than at 32 degrees F., but that in Rome Beauty apples its occurrence is apparently more pronounced at the higher temperature. This suggests that scald in Jonathan and scald in Rome Beauty apples are two different injuries distinct in origin, possibly a physical injury in the Jonathan since its occurrence is worse at the lower temperature, and a chemical injury in the Rome Beauty, since its occurrence is worse apparently at the higher temperature. In appearance, the injuries are certainly distinct, being a soft, clearly defined, light-brown depression in the Jonathan, and a hard, dark-brown lesion, affecting the skin only, in the Rome Beauty.

## Effect of Time of Picking on Development of Scald in Jonathan and Rome Beauty Apples.

Jonathan apples were picked and consigned to the Government Cool Stores on two different dates by the same Drouin grower, and apples of each consignment were stored at two different temperatures. The following table sets out the results of an examination made on 26th June:—

Table XII.: Showing Effect of Time of Picking on Development of Scald in Jonathan Apples.

| Temperature .. .. .. | 32 deg. F. | | 34 deg. | |
|---|---|---|---|---|
| Date of picking .. .. | 24.3.24. | 7.4.24. | 24.3.24. | 7.4.24. |
| Sound .. .. .. .. | 63 | 97 | 73 | 96 |
| Scald .. .. .. .. | 89 | 75 | 84 | 78 |
| Percentage scald .. .. .. | 57 | 44 | 54 | 45 |
| Breakdown .. .. .. | 3 | .. | .. | .. |

During August a further examination was made and scalded apples were again found, in the following numbers, in the various lots:—

Table XIII.: The same.

| Temperature .. .. .. | 32 deg. | | 34 deg. | |
|---|---|---|---|---|
| Date of picking .. .. | 24.3.24. | 7.4.24. | 24.3.24. | 7.4.24. |
| Scalded apples .. .. .. | 10 | 12 | 3 | 6 |
| Total percentage of scald .. .. | 64 | 51 | 56 | 48 |

From the above tables, it will be seen that in the first examination less scald had developed in the fruit picked on the later date, and that in the second examination the differences in the percentages of scald had not altered. Furthermore, the total percentage of scald in the apples picked late was not as great in August as it was in July in the apples picked early.

These results are interesting as confirming the result obtained by D. B. Adam, in 1922, that less scald developed in Jonathan apples picked late, and as illustrating also that the percentage of scald increases the longer the apples remain in cool storage.

Similar experiments were made also with Rome Beauty apples consigned on the same dates. No scald was found in July, but an examination on 11th September gave the following result:—

| Temperature .. .. .. | 32 deg. | | 34 deg. | |
|---|---|---|---|---|
| Date of picking .. .. | 24.3.24. | 7.4.24. | 24.3.24. | 7.4.24. |
| Sound .. .. .. .. | 60 | 81 | 10 | 54 |
| Scald .. .. .. .. | 25 | 19 | 39 | 37 |
| Percentage of scald .. .. | 25 | 18 | 74 | 34 |
| Breakdown .. .. .. | 16 | 8 | 4 | 18 |

The results here are decidedly in favour of the later picking, and confirm the conclusions previously indicated by D. B. Adam in the *Journal of Agriculture,* April, 1923.

## THE AMOUNT EARNED BY A GOOD BULL.

A great many farmers consider a good pure-bred dairy bull to be an expensive luxury—an animal that is very nice to have on the farm, but only an investment for wealthy men. This is quite wrong. If a farmer were to put a good bull to his cows and gradually replace the old stock by heifers that gave better yields than their dams, his extra profits would soon more than cover the cost of the bull. But the money earned by the bull may be calculated in a more direct way than this. Suppose a farmer has 30 low-grade cows, and decides to improve his herd with a pedigree bull having good milk records on both his dam's and his sire's sides. Let us suppose that the low-grade cows are worth £10 a head, and that the price of the bull is £40. It is reasonable to suppose that about twelve heifers will be reared per year. The value of these heifers at calving should be at least £3 per head higher than that of their dams, and this would mean that the bull had earned £36 on his first lot of calves. It is, therefore, clear that a good bull is a profit-earning animal, and it pays to look after him well. If neglected and kept in poor condition, he cannot be expected to throw such good stock as he might produce if maintained in strong and healthy condition. Moreover, a young bull used for two or three seasons and well kept may often be resold at his purchase price.—*Journal of Agriculture,* South Africa.

# APRICOT GROWING.

(Continued from page 108.)

*By W. H. Nicholls, Orchard Supervisor.*

## INSECT PESTS.

### San Jose Scale.

This is one of the most destructive of the insect pests which attack fruit trees. The tiny insects, which are of a pale orange colour, spend their life cycle (outside a few hours' larval existence) under the protection of a hard, firm scale. They breed at an enormous rate, and the young larvae, which are very active, run about in search of fresh wood. They soon become settled, and commence to feed, sucking the sap from the bark. Should they be allowed to remain unchecked the trees soon show signs of distress and become unprofitable. Once established, it is one of the most difficult pests to exterminate, and when infection is first noticed, great care must be taken to ensure the thorough spraying of the trees.

Lime-sulphur, red oil, and the oil-nicotine sprays are most effective. Lime-sulphur at the strength of 1 gallon to 9 gallons water in winter, or red oil at the rate of 1 gallon to 25 gallons water, in winter, or the nicotine-oil spray (as recommended by the Science Branch), will be found most effective.

The formula recommended by Mr. French (Entomologist, Department of Agriculture, Victoria) for preparing the latter spray is as under:—

1 gallon red oil
1 lb. soap
1 gallon water
} Emulsified.

The emulsion is put into a pump of 80 gallons, and 1 pint of nicotine sulphate added. The nicotine sulphate should be well diluted with water before being added to the pump. This emulsion should be applied in winter, so that spraying may be done thoroughly.

### Root Borer.

This is one of the most difficult of all the insect pests to combat, and is causing much concern to orchardists. The perfect insect (which is of a greyish colour) is about ½ inch long, and has a long proboscis, a fact which explains the common name of elephant beetle. The female beetle comes up from the ground, and ascends the tree. She lays her eggs (40 or 50) on the surface of the leaves, then drawing the edges together, she fastens them with a sticky secretion, and so makes a protection. The young larvae soon commence to feed, and make their way to the ground, which they enter in search of the roots. In due course, they attack these, and commence to tunnel. The sap is thus drawn from the tree, which soon dies, the first indication being the dying back of the tips. As the beetles are frequently found feeding on the young tips, a careful examination should be made, and any infected tips gathered and

destroyed. Spray trees well with arsenate of lead at the strength of 1 lb. to 20 gallons water, in spring. It is also necessary to trap the beetles. Zinc or hessian bands will be found useful in this direction. No grass or weeds should be permitted to grow underneath the trees.

### Rutherglen Bug.

These insects cause heavy losses in some seasons, and are also difficult to deal with. If smudge fires are resorted to, we frequently cause the bugs to move from one part of the orchard to another, but do not eradicate them. Phenyle sprays are effective, and the following formula is recommended:—Boil 1 bar common soap with 3 lb. washing soda until thoroughly dissolved, then add 1 quart of phenyle, and make up to 40 gallons with water. Benzole emulsion at strength of 1 lb. to 5 gallons of water is sometimes used, but is much more costly than the phenyle. Nicotine sulphate, 1 pint in 80 gallons of water, is also effective.

### Peach Aphis.

These insects are frequently to be found on the apricot, and cause much damage. As soon as their presence is detected a thorough spraying with tobacco water should be given. If stems or waste tobacco is to be used, soak 4 lb. waste in 5 or 6 gallons water for a few days. Strain and add $\frac{1}{4}$ lb. soft soap dissolved by boiling in $\frac{1}{2}$ gallon of water. Tobacco is obtainable in concentrated form and the use of this obviates the trouble of preparing the above emulsion, and so saves much time.

### Fruit Fly.

Growers are urged to keep keenly alert for this, our worst pest. So much has been said and written about it that most growers should be well informed on its appearance and habits, but too much emphasis cannot be laid on the fact that it rests to a very large extent with the individual grower as to whether it will be stamped out in our State. Constant and careful inspections, quick and drastic actions are necessary.

The whole question of control and prevention of disease in our orchards is based on efficient and systematic spraying. Application of "proved" remedies at the *right* time, and in a painstaking manner, will tend to keep down disease, and make fruit-growing more profitable.

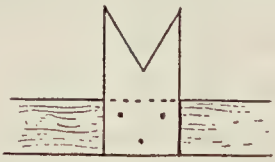
## DRYING.

Owing to the short period that elapses between the first signs of maturity and the time when the apricot is too ripe to market as fresh fruit, growers often make heavy losses. Means have to be employed to avoid this—notably the system of drying. Yet we frequently find that even this outlet is limited owing to the faulty systems followed in grading quality, and in the general "get up" of the pack. Much fruit so processed is quite unfit for the purpose, owing to the common practice of drying fruit that is not fit for any other purpose. The result is an unsaleable and unsightly article, certainly a poor advertisement for our products. Like all other classes of fruit, dried fruit must be graded and well "put up" to ensure ready sale. Many individual growers dry large quantities of apricots annually, and invariably put up a good quality

pack. They seldom have any difficulty in disposing of their pack at payable prices. On the other hand, we find many who do not, apparently, aim at improving their pack. Poorly dried, badly graded and packed fruit is but a drug on the market, and has the natural tendency to lower the reputation of the product.

The most successful men engaged in this branch of the industry set out to obtain a pack of dried fruit that will be readily saleable. To attain this end the fruit must not be picked till it is ripe, so as to ensure good colour texture. It must be handled carefully, and placed in the packing boxes (cases opened on the flat), and stacked in a shady place. Too much emphasis cannot be placed on these points.

The method of drying is as follows:—Make a sulphur box out of ¾-inch pine of sufficient size to cover eighteen to twenty trays, each tray 5 feet x 2 feet, and placed one on top of the other, and cover all joins well with paper. Allow two handles at each end 1 foot from the bottom to facilitate lifting. Trays may be made by using two "droppers" on edge, nailing thin slats close together until required size is obtained, a thin strip being fastened on the outer edge to prevent warping. Sometimes a frame work is made of 2-inch pine, and covered with hessian. It is paper lined, and well coated on the outside with white-wash for a sulphur-box, and has given satisfaction. The box is 5 ft. 2 in. long, 2 ft. 2 in. wide, and 4 feet high, inside measurements.



**Knife for Cutting Apricots.**

A two-edged knife is used for cutting. These can be made at home out of an old saw blade, cut as shown above. It may be fastened to the end of the bench. By this method both hands are available for the operation, and the cutting, which is the most tedious part of the drying process, greatly facilitated. The operator, working between two benches with trays on each side can "place" his fruit with a minimum of trouble.

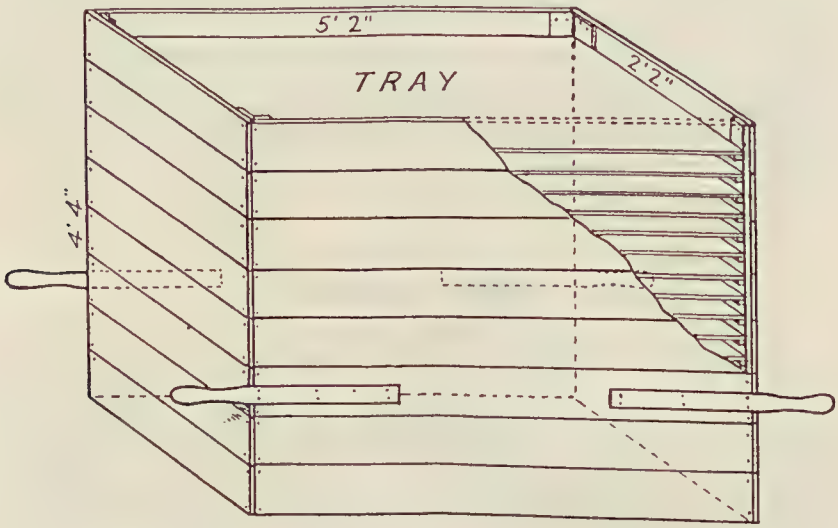
The fruit should be placed on the trays, "cup" or cut side up, the sections being neatly and carefully placed to conserve space. As the trays are "filled," they are stacked neatly one on the other, until sufficient are so placed to fill the sulphur box when put in position. Before setting out the trays of fruit, a cavity is made in the ground of sufficient size to allow a sulphur tin to come up to ground level. This tin is made from a kerosene tin cut on the flat some 2 inches deep, and is placed at one end of the trays.

An even burn of the sulphur is desired, and to ensure this, it is necessary to use live coals or a piece of hessian folded into a narrow strip, and placed on edge in and out of the sulphur. The quantity of sulphur necessary for a box of the capacity depicted is, perhaps, not as important a point as is the time the fruit should remain in the box. The average quantity used is 2 lb. sulphur for 18 trays of fruit, and the time necessary for good quality is not less than seven hours. In fact, the best sample is frequently obtained from trays that have been in

the box overnight. It is necessary at all times to leave the fruit in the box until the "cups" are filled with juice. The box is then lifted off, and the trays carried to the drying green, which should be so situated that dust is absent. Here they are placed in lines, so that each tray may be readily got at, to allow turning of fruit when necessary. The fruit will require careful attention from time to time, and must be turned when the required stage of dryness is obtained. A pliable toughness is desired, not the hard, chippy fruit so often seen.

No fixed time can be given regarding how long the fruit will require to be in the sun, as days vary to such an extent; but when the fruit reaches the state of dryness previously mentioned, it may be placed in bags until such time as the whole crop is processed. The bags are then turned out one at a time, and the fruit hand graded for size, colour, and texture.

The boxes used for packing purposes hold 28 lb. when fruit is "pressed" in. The first two layers are placed in position on the flat,




**Sulphur Box for Drying Apricots.**

and a frame is made to fit the box, and give 4 or 5 inches over, so that the necessary weight of fruit can be put in the box, and "pressed." A press made from an ordinary bench screw fitted into a frame-work will be found quite effective, the block being made to just fit the box. It is then screwed down until the lid may easily be put on and nailed in position, after which the box is reversed, making the bottom the top, and stencil. The fruit being "placed" for the first two layers, and pressed, shows up to its best advantage.

Many growers have adopted a brand for their product, and as they keep up a high standard find the public asking for that particular brand. This state of affairs, of course, is greatly desired by the grower, who, in his turn, must aim at improving his pack and maintaining that feeling of confidence by sending out well dried, well graded, and well packed fruit.

# FERTILIZERS AND THE FERTILIZER INDUSTRY.

(Continued from page 157.)

*By P. Rankin Scott, Chemist for Agriculture, and Will C. Robertson, Supervising Analyst.*

## SUPERPHOSPHATE—*continued.*

### Manufacture.

The writers, in preparing this series of articles, have no object other than to assist the farmer in his calling and enlighten him in plain language regarding the manufacture, composition, functions, &c., of the substances termed "manures" or "fertilizers" which he is using or may use in the future. No academical treatise is intended.

Superphosphate is manufactured by mixing a definite calculated quantity of sulphuric acid with a carefully calculated amount of powdered rock phosphate (tri-calcium phosphate). Sulphur and sodium nitrate, or else nitric acid, with water, are the raw materials necessary to supply the sulphuric acid, which, in forming gypsum, releases the phosphoric acid contained in rock prosphate.

The process is simplicity itself when once a knowledge of the method is acquired. An ordinary workman can carry out the job of mixing providing the control is in the hands of a trained chemist. As in all modern factories—be the product the proverbial pin or a steel rail, a rubber motor tyre or a box of sweets—the man in a fertilizer factory carrying the heaviest responsibility is the individual exercising control —the chemist.

There are many popular fallacies existing among the farming community of Victoria, and one fairly prevalent is the belief that the farmer should manufacture his own requirements in the way of superphosphate. For the existence of this notion there are, of course, some grounds, and it is the fact that the production on the farm of fertilizers would mean a large yearly saving that has made many farmers cling to it.

Speaking generally, the average farmer is, if we may be permitted to use the term, a "jack of all trades"—a "bush" carpenter, with a knowledge of bricklaying and plumbing, a blacksmith, and, in a small way, a motor mechanic, a "horse doctor" of no mean repute, and, when necessary, a butcher. The farmer, by nature of his calling and isolated situation, must perforce apply himself in very many ways which result in a considerable expansion in his knowledge and practice.

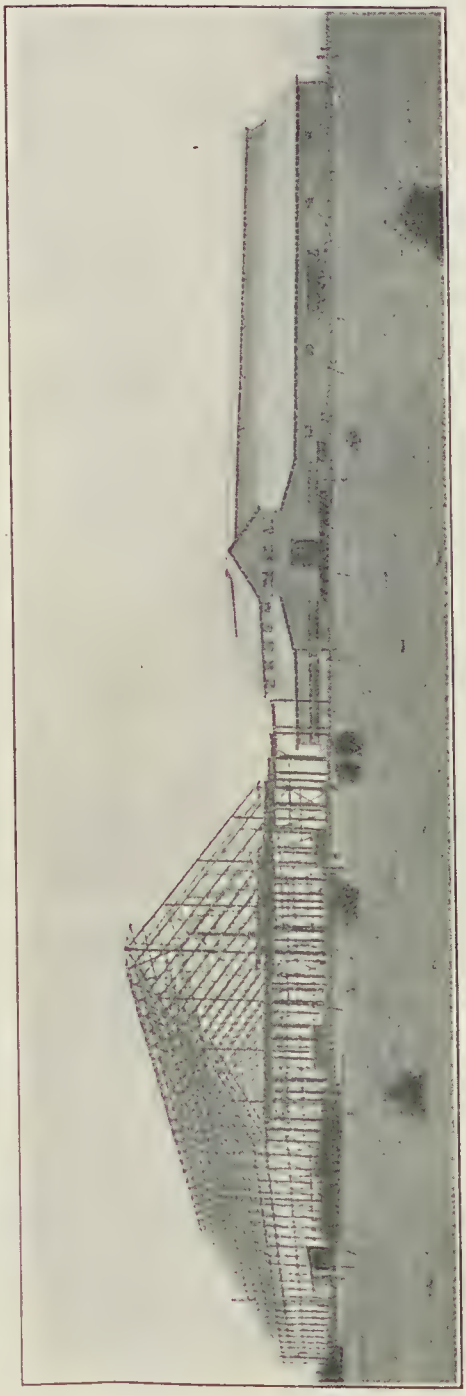
In the science of chemistry, however, his knowledge is very meagre, and when he learns that superphosphate contains gypsum, he commences to form his own conclusions. He imagines that superphosphate is manufactured from gypsum or limestone. A visit to a superphosphate factory in the metropolis strengthens this belief, for he sees a stone-coloured rock or powder being converted into superphosphate. This material appears to him as exactly similar to "some stuff" he has noticed in the "bush" paddock at home, possibly marl, limestone, gypsum, or worthless silurian rock. In his vivid imagination, the rest is easy. His hopes are shattered only after a visit to the laboratory with a sample of the "find," which he proposes to use as a raw material.

It is surprising the number of inquiries of this description which are annually answered in the laboratory —one actually taking place at the moment of writing with a farmer from the Western District.

No! There is little probability of the farmer manufacturing superphosphate on the farm, even supposing he was sufficiently lucky to find a phosphate deposit on his property.

Of one thing he can rest assured, and that is:— Superphosphate cannot be manufactured by treating marl, gypsum, chalk, limestone, or other non-phosphatic substances with sulphuric acid. Gypsum certainly does occur in superphosphate; as a matter of fact, there is approximately 1 ton of gypsum in every 2 tons of superphosphate, but it is formed during the process of manufacture, and its presence is due to the fact that rock phosphate (insoluble phosphate) is converted into superphosphate (superior or soluble phosphate).

There are many considerations attached to the proposition of a superphosphate factory. First and foremost, a lot of money is required to pay for the erection of the factory and the preliminary expenses associated therewith. A one-unit superphosphate plant, capable of producing 25,000 tons of the fertilizer per annum, would cost, approximately, £100,000, and a further sum of £50,000 would be very handy.



New Superphosphate Factory in Course of Erection at North Geelong.

The next thing is to obtain the services of competent professional men—a chemist, an engineer and draftsman. Really competent men in these professions are by no means as common as is often supposed, and it is on their ability that success in a great measure depends.

After obtaining the requisite capital and engaging a staff, the next step is to select a suitable site—a problem of considerable difficulty at all times, but especially so in Victoria. The site should be on the water-front, giving facilities for discharging cargoes of raw material from large ocean-going vessels, and, if necessary, providing facilities for water transport for portion of the output. Good road and rail transport should be available, and the site should be close to a district where suitable labour will be obtainable when required. These are the essential requirements for a suitable site for superphosphate works, but, of course, there are many secondary ones.

The general tendency nowadays is to group industries whereby pronounced economies in overhead expenses, distributing costs, &c.,

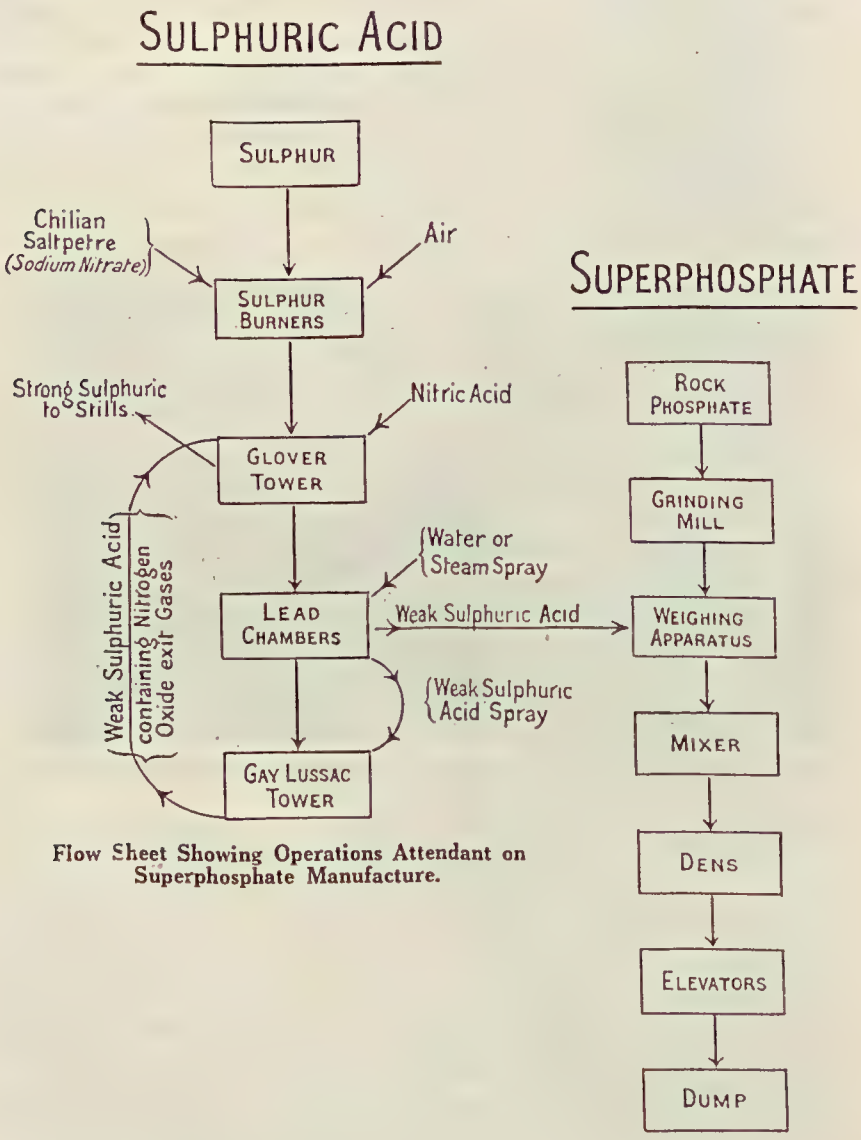
**Unloading 5,000 tons of Sulphur at a Superphosphate Factory Wharf, Yarraville.**

are effected. A research department should be installed, not only to control "costings," but to discover new lines for expansion.

Working on these lines, the proposed site should have access to a cheap power supply, and provide facilities for economical transport within the works—if by gravitation, all the better. Then there is the need for storage accommodation—very often a site will lend itself to considerable savings in the space available—elevators will fill an excavated basement where they only half fill an overhead building. The system of grouping industries has much to commend it, especially in the case of the needs of the agricultural community.

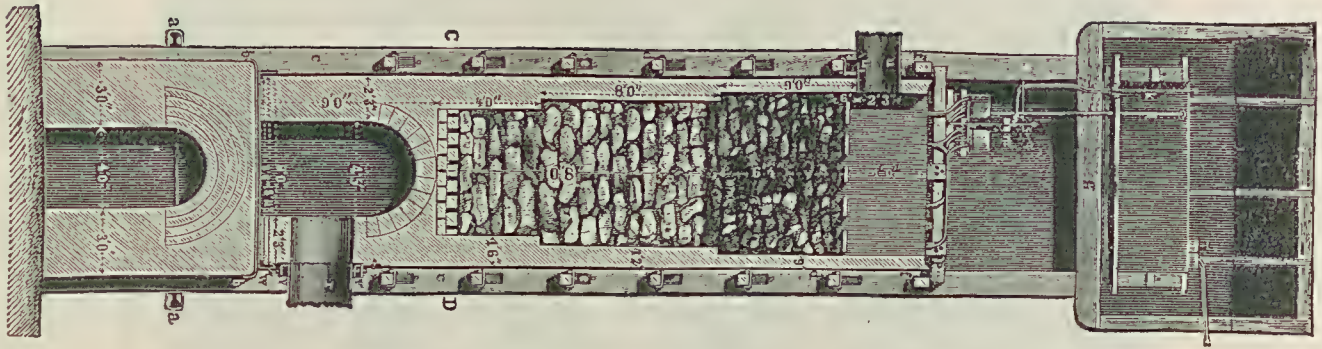
Chemical works producing superphosphate and other artificial manures are eminently suitable for the manufacture of fungicides and insecticides. The chemist manufacturing artificial fertilizers can just as readily manufacture the "sprays," "dips," &c., so essential in modern farming, and the propagandist (a technical man) can obtain orders through the selling agent for a gallon of weed-killer or 1 cwt. of insecticide, while booking an order for fertilizer.

The savings effected by a scheme of this description are obvious and need no discussion; suffice it to say that, in addition to the economy in overhead costs, even the lay mind can imagine the many savings effected at the factory. These remarks are of direct concern to the farmer, and indirectly to the community at large.




**Flow Sheet Showing Operations Attendant on Superphosphate Manufacture.**

The manufacture of superphosphate may be divided into two sections, viz.:—(*a*) The manufacture of sulphuric acid from sulphur; and (*b*) the subsequent admixture of the sulphuric acid with powdered rock phosphate.




**A Section of a Glover Tower used in Sulphuric Acid Manufacture.**

Lined with very heavy sheet lead and, at the bottom where the heat is greatest, a thick lining of firebrick, which must be of special quality to resist the action of heat and strong acid. "Filling" or "Packing" is quartz or some similar non-corrosive substance.

The gases from the sulphur burners enter at the bottom through the inlet shown at **r** and pass upwards. At the top is shown the tank which distributes the strong sulphuric acid which is concentrated and denitrified. The sulphur gases impregnated with nitrogen oxides pass out at the outlet shown on the left hand top side on their way to the chambers.

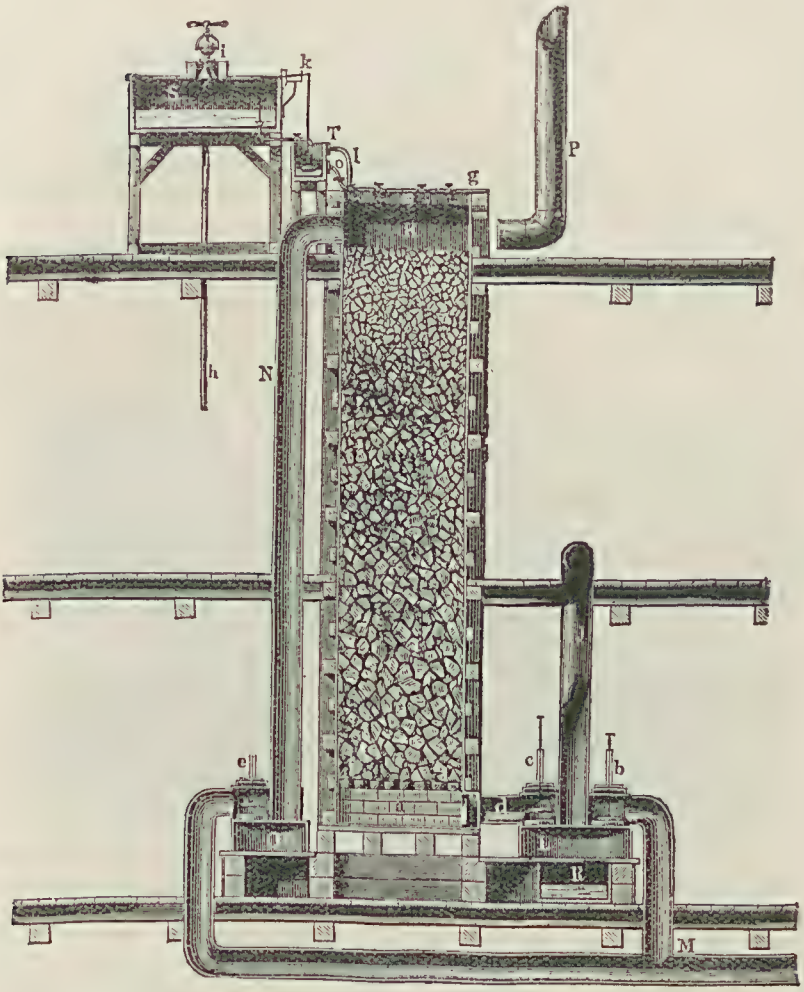
The Glover Tower has many advantages, but for the purpose of this article, let it suffice to say that it exerts a marked influence on the conversion of the sulphur fumes into sulphuric acid.

The flow sheet on page 242 illustrates the various stages of the manufacture.

It is not an easy task to explain in a simple way the intricate, highly technical manufacture of sulphuric acid, but for the purpose of this article, the following brief outline of the process will, perhaps, be sufficient:—

**Lead Chambers, Showing Sulphur Storage Underneath.**

Sulphur, in the form of brimstone, is fed into a furnace termed a "burner," in which it is ignited in the presence of a regulated excess of air. A definite amount of nitre (Chilian saltpetre or sodium nitrate) is placed in pots in the flues of the "burner" which, in decomposing, supplies the necessary nitrogen-oxide gases to oxidize the fumes of burning sulphur (sulphur di-oxide). The sulphur burns in the air




**A Section of the Gay Lussac Tower as Used in the Manufacture of Sulphuric Acid.**

Tower is built of sheet lead supported by frame. The packing is hard burnt coke usually, but in some instances glass or other substances able to withstand the action of acid are used.

The acid is sprayed into the tower from the tank shown at S. The gases from the chambers enter at the bottom. The "falling" acid absorbs the valuable nitrogen oxides from the gaseous mixture, and the denitrified gases escape either at the top or are utilized for the purpose of creating draught for the chambers.

(with the rigid control of the air admitted, it appears as though the air is burning in sulphur) to the gas sulphur di-oxide, the fumes of which are so perceptible when sulphur is burnt in air.

The sulphur di-oxide, mixed with the nitrogen-oxide gases, which are evolved from the nitre pots, or nitric acid, and an excess of air, passes from the burners into a larger tower, called the Glover tower,* after the designer, where the gases meet with a spray of dilute sulphuric acid containing either nitrogen-oxide gases or nitric acid, or both, obtained from previous reactions. The hot gases from the burners concentrate the acid in the tower, while at the same time liberating the nitrogen-oxide gases mechanically held therein.

The mixture of sulphur and nitrogen-oxides in the gaseous state, with the steam derived from the concentration of the weak sulphuric acid in the Glover tower, pass into larger lead chambers, where they are met with a fine water spray. In some instances sodium nitrate is fed into chambers also, for the purpose of reinforcing nitrogen oxide gases. Sulphuric acid is formed by the combination of sulphur tri-oxide and water. The acid condenses and falls down the walls of the lead chamber to collect in launders arranged at the bottom.

The exit gases containing nitrogen-oxides (the catalyst of the chamber reaction) from the chambers pass thence into another tower, termed the "Gay Lussac"† (named after the inventor), where they meet a spray of "chamber" acid (acid derived from the "chambers") which absorbs the valuable and expensive nitrogen-oxide gases.

The weak acid from the Gay Lussac tower, as already stated, is conveyed to the Glover tower to act again and again as a carrier for the nitrogen-oxide gases, so essential for the formation of sulphuric anhydride (sulphuric acid gas) from the fumes of burning sulphur.

The weak acid from the Gay Lussac tower, in becoming concentrated in the Glover tower (due to the high temperature of the gases flowing in from the sulphur burners or combustion chamber), supplies some of the water (steam) necessary for the formation of sulphuric acid in the chambers.

This is but a brief outline of the manufacture of sulphuric acid, written expressly to afford the farmer some little enlightenment on a complex process. The manufacture of sulphuric acid in detail is of a highly technical nature, and in its intricacies, one of the most fascinating studies of the trained chemist. Improvements in the process are continually being evolved, and one of recent origin is worthy of remark, viz.:—The rotary sulphur burner. A photograph of one of these is to be seen on page 247. It consists of a long horizontal iron or steel cylinder, which slowly rotates, and into which the sulphur is fed and burns; the gases, with the regulated supply of air, pass into a large combustion chamber lined with firebrick. From the combustion chamber, the mixture of gases pass into the Glover tower, and thence through the process already described. One of these rotary burners does the work of seven of the stationary type; an illustration of a battery of stationary burners is shown on page 248.

Although all the sulphuric acid manufactured in Victoria and Western Australia is made from sulphur, in South Australia, New

* See illustration on page 243. † See illustration on page 245.

South Wales, and Tasmania, the raw material utilized is the lead-zinc concentrates (metallic sulphides) from the Broken Hill mines. The concentrates are roasted in a stationary burner of a special type, and thereby produce the necessary sulphur di-oxide (sulphur fumes); the residual oxidized concentrates, containing the valuable metals zinc and lead, are despatched to the Electrolytic Zinc Works at Risdon, Tasmania, where the zinc is recovered practically pure, and the lead dross reshipped back to Port Pirie for the recovery of the lead.

The great advantages of this process are:—

(*a*) The establishment of the zinc industry in Australia.

(*b*) The use of the sulphur fumes, the formation and disposal of which are absolutely essential to the zinc process as a source of sulphur supply, thereby, if necessary, making Australia independent and self-supporting as regards sulphur.

**Sulphur Burner (Rotatory Style) Showing Combustion Chamber and Glover Tower.**

(*c*) The conservation of natural wealth, in that gold must be sent out of Australia for every ton of sulphur imported from a foreign land.

Unfortunately, the manufacture of sulphuric acid from these metallic sulphide concentrates is not as easy or as clean as the manufacture from raw sulphur. In most cases, the chamber process is the process followed; but at Port Pirie, South Australia, and at Risdon, Tasmania, the "contact" method is adopted. In the "contact" method, the sulphur fumes (sulphur di-oxide) are directly oxidized to sulphuric acid gas (sulphur tri-oxide or sulphuric anhydride) by the action of a catalyst—usually spongy platinum or platinized asbestos. The method may not be so economical as the chamber process of sulphuric acid manufacture for the purpose of superphosphate manufacture, especially when the sulphur supply is obtained from Broken Hill concentrates; yet it is eminently satisfactory from the Australian standpoint. A glance at the "flow sheet" on page 242, which shows the

steps in the manufacture of sulphuric acid, will help the reader to follow the operations.

Briefly, sulphur is burnt in a rotary or stationary furnace in a regulated supply of air, and the sulphur fumes are then mixed with oxides of nitrogen gases, which are obtained either from Chilian saltpetre or nitric acid. The mixture of gases is then sent to chambers of

Battery of Old Type of Stationary Sulphur Burners.

calculated space, where they meet with jets of water or steam, and sulphuric acid is formed.

Sulphur, air, nitrogen-oxides, and water are the ingredients necessary; but the nitrogen-oxides act only as a catalyst, and are recovered to be used over and over again.

*(To be continued.)*

# SUBSIDY FOR HERD TESTING ASSOCIATIONS.

## Conditions of Government Grant.

The Department of Agriculture makes a grant of approximately one-half of the expenditure incurred in the administration of the association, conditional upon the strict observance of the following rules and regulations, and provided, also—

1. That every member undertakes to effect, and does effect, the culling from the herd of all cows which, having reached the age of six years, have failed in each of two consecutive lactation periods, to produce 175 lb. of butter-fat;
2. That the association undertakes that within fifteen months of the establishment of the association, 20 per cent. of the bulls being used for service in the herds of members shall be ex dams which, under Government test, have reached the standard prescribed by the regulations governing the testing of pedigree herds, and that the percentage of such record bred bulls used by members shall increase at the rate of 20 per cent. per annum thereafter.

## SUBSIDIZED HERD-TESTING ASSOCIATION.

### Rules and Regulations.

1. The name of the association shall be Herd-testing Association.

2. The aim of the association shall be the improvement of the dairy herds of members by an efficient system of testing and recording yields whereby members may ascertain which cows in the herd are profitable and which unprofitable.

3. A general meeting of the members of the association shall be held once each year in June to receive report of the work of the association for the past year, and for the election of officers for the following year, and also for the consideration of any other business which may be brought forward.

4. The business of the association shall be carried on by a committee, which shall consist of a president, two vice-presidents, secretary, and treasurer, and seven members to be elected each year at the annual meeting.

5. The association may accept as members dairy farmers in the and surrounding district.

6. The elected committee shall be notified by the secretary of the date and place of meeting.

7. A quorum shall consist of five members with the president or one of the vice-presidents.

8. For the purpose of supply, should a quorum not be present, the president and secretary jointly shall have power to sign cheques for wages due to the tester and for testing supplies.

9. A secretary shall undertake the following duties:—He shall keep the books, attend to the correspondence, compile the records of all tests made by the tester, and enter same into the official register.

10. The secretary shall give members a progress report of their herd if requested.

11. The fee for membership shall be at the rate of per annum for each cow in the member's herd or herds, and be payable in two equal instalments half-yearly, and shall be due on the first day of July and the first day of January each year.

12. The fee shall be paid on the estimated number of cows to be milked during the season—where any variation occurs, the amount shall be adjusted by the secretary each half-year.

13. Members must submit every cow in the herd or herds for testing, and any cow which has been once tested shall be deemed a cow for the purpose of assessing the fees due to the association, and also for the purpose of compiling the average production per cow in the herd.

14. Each member shall sign an agreement with the association to remain a member for two years, and in the event of default to be liable to the association for an amount equal to the sum he would have paid as a member, excepting in the event of a bonâ fide sale; but should the dairyman return to dairying during the period of the agreement he shall be deemed to have been dairying for the full period and shall be liable to the association for the full amount.

15. For the purpose of compiling official records, the lactation period shall commence on the seventh day after calving, and be completed on the two hundred and seventy-third day after commencement.

16. In the case of a member commencing to test his herd for the first time, or in cases where it has been impracticable to test any cows until after they have calved two or more months, such cows may be credited with sixty days' production based upon the first test made by the testing officer, unless the owner desires an exemption, which may be granted.

17. The association shall employ a testing officer at a salary to be fixed; such appointment shall be subject to the approval of the Department of Agriculture, and subject to cancellation by the association for good or sufficient cause, or on request by the Department of Agriculture.

18. (a) The testing officer shall visit each member's farm or farms, in the order he may decide, at least once in each calendar month, not necessarily in the same order, and he shall not notify members directly or indirectly of the intention to visit.

(*b*) The testing officer shall weigh the milk yielded by each cow at each milking during the duration of such visit, and shall take fair samples of each cow's milk at the rate of 1 c.c. of milk for each pound weight yielded at two consecutive milkings, and shall ascertain by the Babcock method the amount of butter-fat contents of such milk.

19. The testing officer shall be provided by the association with an approved Babcock testing outfit, and shall provide a horse and vehicle for transporting himself and outfit to the different farms.

20. The testing officer shall be provided with food and lodging for himself and fodder for his horse free of charge by the member for whom he is testing during such time as is occupied in testing the member's herd.

21. The testing officer shall be supplied with the following details of each cow in each member's herd:—Age, colour, marks or brands, and date of calving, and also the pedigree to the extent known.

22. The testing officer shall, if asked, give to the member a check sample of the milk at the same time as he takes his own sample for testing.

23. The testing officer shall, at the end of each week, furnish to secretary a full report of the testing done for the week, and also give a full detailed account of each and every sample taken for the purpose of entry in the register.

24. The association shall issue to its members a certificate for all animals producing an amount of butter-fat equal to or above the following standards:—

Junior 2-year-olds (heifers starting lactation period under 2½ years old)—Fat, 130 lb.;

Senior 2-year-olds (heifers starting lactation period under 3 years old)—Fat, 150 lb.;

Three-year olds (cows starting lactation period between 3 and 4 years)—Fat, 175 lb.;

Mature cows, over 4 years—Fat, 200 lb.

Such certificate must clearly describe the animal by stating the breed, colour, colour markings, brands, marks, and other distinguishing features to ensure permanent and definite identification.

25. The secretary of any association shall forward to the Director of Agriculture, on or before the 31st day of July in each year, a balance-sheet of the association, and a report on every herd tested during the year ending 30th June prior, showing the number of cows which completed their lactation period in the following form:—

.....HERD TESTING ASSOCIATION.

Report for the Year ending 30th June, 19.....

Owner..... Association sign.....

Address..... Herd letter.....

No. cows in herd..... No. acres property..... Value per acre.....

No. cows completed test.....

Food purchased during year.....

| Cows (No.). | Age. | Class. | Calving Date. | Date of Entry to Test. | Period of Test Days. | Milk. | Test Average. | Butter Fat. | Milk Last Day. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | lb. | | lb. | lb. | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

# STALLION REGISTER 1924-25,

**under the "Horse Breeding Act 1919".**

## Part IV.*—Registrations after 1st September, 1924.

| Cert. No. | Name. | Age. | Class. | Owner. | Address. |
|---|---|---|---|---|---|
| | | Yrs. | | | |
| 1540 | Abbotsford .. | A | Draught .. | McGregor Bros. | Rochester |
| 1562 | Aberdeen .. .. | A | Light .. | W. Haymes .. | Ballarat |
| 1575 | Almont of Rythsdale | A | ,, .. | T. J. Burt .. | Cowwarr |
| 1587 | Baron Aldie's Hero.. | 4 | Draught .. | A. Macphail .. | Hedley |
| 1578 | ,, Argyle .. | A | ,, .. | W. Hegarty .. | Donald |
| 1601 | ,, Brae .. | A | ,, .. | W. Wright .. | Pelluebla |
| 1527 | ,, Lee .. | 4 | ,, .. | J. D. White .. | Box 97, Minyip |
| 1572 | Belmain .. .. | A | ,, .. | J. J. Carroll .. | Watchem |
| 1556 | Black Wasp .. | 3 | Pony .. | E. Wheelahan .. | Ballan |
| 1613 | Bold Jock .. | A | Draught .. | J. Bayliss .. | Eaglehawk |
| 1612 | ,, Rowan .. | A | Light .. | W. W. Kernick .. | Sebastopol |
| 1590 | Bonnie Brae .. | A | Draught .. | Walder & Sons .. | Watchem |
| 1576 | Boro Sportsman .. | A | ,, .. | C. F. Moltke .. | Merino |
| 1546 | Bronzewood .. | A | Thoroughbred | Quinlan Bros. .. | Oaklands Junction |
| 1593 | Brown Lad .. | A | Draught .. | T. Foley .. | Birchip |
| 1611 | Buck .. .. | A | Pony .. | Dolman Bros. .. | Coleraine |
| 1517 | Capitalist .. .. | A | Draught .. | A. K. Urquhart | Boonerah, Hexham |
| 1534 | Captain Black .. | 4 | Thoroughbred | J. Flannagan .. | Omeo |
| 1545 | Celmar Style .. | A | Light .. | W. Cochrane & Sons | Doveton-street, Ballarat |
| 1599 | Come More .. | A | Pony .. | J. McDonald .. | Orbost |
| 1582 | Congress .. .. | A | ,, .. | T. Diskin .. | Beeac |
| 1565 | Convincer .. | A | Draught .. | H. McLean .. | Rupanyup |
| 1605 | Craigwillie of Bolobek | A | ,, .. | W. Walter .. | Tatura |
| 1526 | Dalmore Pride .. | 5 | ,, .. | W. T. McAlpine.. | Hopetoun |
| 1617 | Direct Alto .. | A | Light .. | H. D. Morse .. | Bridgewater |
| 1535 | Don Marvin .. | A | ,, .. | J. Rousch .. | 236 Nicholson-st., Footscray |
| 1570 | Forester .. .. | 3 | ,, .. | R. Low .. | 91 Park-street, South Melbourne |
| 1603 | Fulham Gardiner .. | A | ,, .. | W. & J. Cockbill | 407 Post Office-pl., Melbourne |
| 1554 | Glad Bells.. .. | A | ,, .. | S. Dowker .. | Shepparton |
| 1559 | Glen Arthur .. | 3 | Draught .. | J. Alexander .. | Caniambo |
| 1586 | Glenmore .. .. | 6 | ,, .. | T. McKenzie .. | Shepparton |
| 1567 | Glynngaroff .. | A | Pony .. | E. Peel .. | Cohuna |
| 1607 | Happy Vein .. | A | Thoroughbred | Fitzpatrick Bros. | Boort |
| 1589 | Harry Alto .. | A | Light .. | L. J. King .. | Quambatook |
| 1594 | Highland Boy .. | A | Draught .. | S. E. Moss .. | ,, |
| 1574 | His Majesty .. | A | ,, .. | T. Burt .. | Cowwarr |
| 1609 | Honest Style .. | A | Light .. | J. Hunt .. | Merrigum |
| 1596 | Jack Smith .. | A | Draught .. | S. Maddern (Jnr.) | Leongatha |
| 1614 | Jimmy Lea .. | A | Light .. | Wm. Bradshaw | Skipton |
| 1619 | Kelso .. .. | A | Draught .. | Canty Bros. .. | Nandaly |
| 1621 | King Bruce .. | A | Light .. | J. Pearce .. | Wodonga |

Part I. was printed in this *Journal* of January, 1925, Part II. in that of February, and Part III. in the March *Journal*.

Stallion Register, 1924-25—*continued*

| Cert. No. | Name. | Age. | Class. | Owner. | Address. |
|---|---|---|---|---|---|
| | | Yrs. | | | |
| 1561 | King Clyde .. | A | Draught .. | W. Halley .. | Terang P.O. |
| 1597 | Lanark's Pride .. | A | ,, .. | P. C. Martin .. | Boyeo |
| 1560 | Little Welshman .. | A | Pony .. | J. Cameron .. | Timor, W. |
| 1571 | LlangGraeme .. | A | Thoroughbred | O'Brien & Johnston | Cowwarr |
| 1606 | Llewellyn II. .. | A | Pony .. | M. Fontana .. | Lubeck |
| 1569 | Lord Lonsdale .. | A | ,, .. | D. G. Tomkins .. | Clover Flat, Coleraine |
| 1620 | Lord Craig .. | 2 | Draught .. | T. Collins .. | Deniliquin |
| 1600 | ,, Roberts .. | A | Draught .. | W. K. Stokes .. | Echuca |
| 1563 | Major Clyde .. | 6 | ,, .. | J. J. Gleeson .. | Corack East |
| 1615 | Master Vengeance .. | A | Light .. | W. Bradshaw .. | Skipton |
| 1544 | Maurite .. .. | A | ,, .. | Mrs. P. Kervin .. | Cohuna |
| 1580 | Mellington Colonel II. | 5 | Draught .. | T. O'Donohue .. | Garfield |
| 1602 | Menkawrah .. | A | Thoroughbred | Mrs. A. Vallence | Cohuna |
| 1566 | Mountain Chief .. | A | Draught .. | J. M. Connelly .. | Box 43, Birchip |
| 1555 | Once Again .. | 3 | Pony .. | A. P. Wade .. | Glen Alvie |
| 1577 | Ondit .. .. | 2 | Draught .. | Exors. of late N. Thornley | Hawkesdale |
| 1557 | O.Y.D. .. .. | A | Light .. | T. Kennedy .. | Eddington |
| 1598 | Peter Eden .. | 5 | Draught .. | J. Dyer .. | Benambra |
| 1591 | Pleasant Voyage .. | A | Light .. | W. Ohlin .. | Gooramadda |
| 1543 | Prince Binnia .. | A | ,, .. | C. Nolte .. | Merino |
| 1639 | Red Dennis .. | A | Thoroughbred | C. J. Chisholm .. | Corryong |
| 1581 | Rifle Boy .. .. | A | Pony .. | P. R. Cooke .. | Euroa |
| 1541 | Rockfeller .. | A | Light .. | Clayton Bros. .. | Kyabram |
| 1542 | Sarsfield .. .. | A | Pony .. | W. G. Hicks .. | 107 Thistlewaite-st., Sth. Melbourne |
| 1584 | Scotland's Fancy .. | A | Draught .. | T. Daffy .. | Swan Marsh |
| 1573 | Scottish King .. | 3 | ,, .. | D. Kenneally .. | Longwarry Sth. |
| 1564 | Selection .. .. | A | ,, .. | C. Watson .. | Glen Forbes |
| 1547 | Sharpshooter .. | A | Light .. | J. Russell (jnr.) | Orbost |
| 1592 | Shirley Bantam .. | A | ,, .. | B. Gannan .. | Penshurst |
| 1604 | Signet .. .. | A | Draught .. | J. Roberts .. | Kunat P.O. |
| 1608 | Sir Samuel .. | A | ,, .. | J. McCarthy .. | Boisdale |
| 1548 | Snowdrop .. | 5 | Light .. | A. J. Staughton .. | Terang |
| 1579 | The Grocer .. | 3 | ,, .. | C. A. Lesser .. | Coleraine |
| 1610 | The Premier .. | A | Draught .. | J. Roberts .. | Kunat |
| 1594 | The Standard .. | A | ,, .. | G. N. Morrish .. | Ouyen |
| 1553 | Tommy Burns .. | 6 | ,, .. | E. Sherwell .. | Speed P.O. |
| 1552 | Trilight .. .. | A | Light .. | R. P. Nicol .. | Yarram |
| 1550 | Young Estell .. | A | Pony .. | C. E. Smith .. | Trymple |
| 1588 | ,, Hero .. | A | ,, .. | N. Ford .. | Franklinford |
| 1616 | ,, Hobby .. | A | ,, .. | L. Durling .. | Powlett River |
| 1568 | ,, Timekeeper | A | Draught .. | Conroy Bros. .. | Model Farm, Bolwarrah |

# A WORD ON GUANO.

Exception has been taken to the statement made in the paragraph "No bird guano, &c.," printed under the heading "A Word on Guano," in the article on "Fertilizers and the Fertilizer Industry," appearing in the March issue of this *Journal* (pages 150-151).

This paragraph has to be read and construed with the preceding paragraphs. The "bird guano" referred to—an analysis of which was quoted—is the highly concentrated soluble ammoniacal complete fertilizer, deposits of which could only accumulate in rainless, or practically rainless, parts of the globe.

Rain-washed deposits, or phosphatic guanos, were not meant, and it should not be inferred that the writers contend that no water insoluble, non-nitrogenous deposits exist in Australia, or in the islands of the Pacific.

# ORCHARD AND GARDEN NOTES.

## The Orchard.

*E. E. Pescott, F.L.S., Pomologist.*

As soon as the fruit is off the trees, the land should be well ploughed and left in a rough condition until the spring ploughing. If not already done, and the orchard conditions demand it, there is still time to put in a leguminous crop for green manuring purposes. But this should be done as early as possible, so as to give the crop a chance to make some good early growth. Soils deficient in lime or in organic matter are always benefited by a crop of green manures. Where stable manure is unprocurable, the green manure crop is the only means of adding organic matter to the soil.

### Pests and Diseases.

All second-hand and old cases should be thoroughly overhauled. It is preferable to do this work now, instead of leaving it till spring, when the rush of other duties will certainly prevent it being carried out. The cases, if not bad enough to be destroyed by fire, should be dipped for some time in boiling water. And this is not only for the killing of the codlin larvæ, but also to destroy larvæ or eggs of any scale or aphis, and also any spores of fungus diseases that may have found lodgment therein.

As soon as the trees have shed their foliage they may be sprayed with lime sulphur spray for woolly aphis, peach aphis, and the bryobia mite. And this should be done before pruning, so that in handling and carrying the prunings the pests will not be spread about the orchard to infect the clean portions.

In areas where Fruit Fly is suspected, a strict watch should be kept for perforated or infested fruit, all of which should be destroyed by boiling for forty minutes.

## The Flower Garden.

Bulbs, tubers, and corms of spring-flowering plants should now all be planted. As they appear above ground, they should be protected from the ravages of snails and slugs, as these pests have a very great

liking for these succulent growths. A good surface dressing of broken leaf or dust tobacco will effectually deal with these pests. In fact, the gardener who constantly uses tobacco, either in the leaf, stem, or dust forms, will very soon be in the happy position that slugs and snails will cause him no anxiety whatever. Besides, the tobacco has manurial properties which are also valuable.

Pansy and any other seedlings, also rooted layers and cuttings, may now be planted out into their permanent positions.

Sowings may also be made of any hardy annuals, such as antirrhinum, aquilegia, correopsis, Canterbury bell, dianthus, everlastings, foxglove, gaillardia, hollyhock, larkspur, leptosyne, lobelia, marigold, pansy, petunia, stock, sweet peas, verbena, wallflower, &c.

## The Vegetable Garden.

There should now be no untidy or undug beds in the kitchen garden. The vacant beds should all be well dug over and prepared for the planting of vegetables for use in spring. In digging, a top dressing of manure should be given; this may be dug in. All weeds, too, may be forked into the trenches, and covered well with soil as each spit or length is dug. A dressing of lime is very beneficial at this time of the year three or four weeks after the manure or weed dressing.

A start should now be made at cleaning out the asparagus beds. This vegetable is most popular, and yet one rarely met with in ordinary household gardens. It is supposed to be difficult to grow, but this supposition is not borne out, as, once established, a bed of asparagus is one of the most easily managed plots in the whole garden. Depth of good soil and plenty of manure are all that this plant requires.

In establishing a new bed, it is advisable to see that there is a good depth of 2 or 3 feet of rich, well-manured soil. If this is not present, the soil should be dug out to that depth, and thoroughly mixed and enriched with well-rotted manure before being replaced. A bed deeply prepared, and supplied with ample quantities of manure, should last without replanting for very many years. The young plants or crowns should then be planted in trenches, keeping the rows 2 or 3 feet apart. An asparagus bed requires ample and direct exposure to the full rays of the sun. The asparagus should not be cut during the first season after planting; in fact, it is better to allow it to go uncut for two seasons. As little foreign weed growth as possible should be allowed in the beds, but, when they are not producing culinary asparagus, rows of lettuce, beans, radish, &c., may be grown between the crowns.

Towards the end of April the tops may be cut down, the beds cleaned, and a good top dressing of stable manure given. Chemical fertilizers, such as bonedust, sulphate of ammonia, and sulphate of potash, may be given as a substitute to organic manure. In the past it has been the custom to annually top-dress the beds with salt. It was supposed that, as asparagus in its native habitat was usually found in sandy soils near the sea coast, the plant required salt or a saline soil to produce successful results. It has been found, however, that salt is not at all essential to good growth, and that the plant will readily adapt itself and grow well in soils of not at all a saline character. Where potash has taken the place of salt, quite improved results followed.

Seeds of onion, turnip, cabbage, cauliflower, carrot, and parsnip may now be sown.

# REMINDERS FOR MAY.

CATTLE.—Cows, if not housed, should be rugged. Rugs should be removed in the daytime when the shade temperature is above 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. Calves should be kept in warm dry shed. Observe strict cleanliness in feeding to avoid losses and sickness incidental to calf-rearing.

All cattle should be provided with a lick consisting of 20 lb. salt, 20 lb. bone meal, 20 lb. slaked lime, and ½ lb. sulphate of iron.

PIGS.—Sows not already served should be put to the boar. Supply all pigs with plenty of bedding, and see that sties are warm and well ventilated. Supply sows liberally with grain. Castrate young boars as early as possible. Pigs should be highly profitable now, as pork is very dear. Rape barley (especially skinless), oats, &c., may be sown for grazing during winter. Pigs should be supplied with plenty of charcoal and bone meal. Crushed oats will be the most economical feed for pigs at present prices.

SHEEP.—Lambing is in full swing during the month of May—particularly in the warmer districts. Ewes should be kept in strong condition—neither too fat nor excessively fat. When the lambs are dropping, the most liberal treatment possible so far as concerns feed, shelter, and general attention pays; this care should be continued until the lambs are weaned.

Self-preservation being such a very strong factor in nature, it follows that badly-fed ewes will make bad mothers. Very old or very young ewes, if underfed, are usually very neglectful of their new-born lambs.

Late April and early May lambs may be marked towards the end of May. This work should be done in fine weather, and, if possible, most of the marking should be completed by, say, 3 p.m., so as to allow the lambs to mother before the evening sets in. It is advisable to yard lambs with their mother the night before marking, so that the work will not be undertaken when the lambs are overheated. A rest after the operation is also advisable to permit of a lessening of the blood-flow from the wounds before travelling. Most flock-owners are agreed that the purse of male lambs should be drawn tight by the fingers, and the end completely severed. Slitting the purse is far too tedious, and is not recommended in any circumstances. In tailing, never draw tails tight, as the projecting bone will delay healing; particularly so if hot blades are used. Even when the cutting is done with a knife, enough loose skin should be left to cover the bone and veins so as to check the strong flow of blood which usually occurs in lambs of well-fed mothers. Losses should be avoided in every possible way.

If not already done, sheep should now be crutched, as the young grass of May tends to cause scour. Wool-blindness in fine-wooled sheep may now need attention. In wet districts, dry paddocks should be used to the full extent. A sharp look-out must be kept for such pests as foxes, rabbits, eagles, dogs, &c.

## BEE-KEEPING.

May is the last month during which bees may be examined, handled, and, if necessary, fed without risk of endangering the existence of the colonies or seriously interfering with their safe wintering. Supers (upper stories) should be removed and stored indoors in a dry place, care being taken that bee moths cannot get access to the combs. Where suitable storage room is not available indoors, the boxes of spare combs may be left outside, but should be placed underneath the box containing the cluster of bees and the entrance to the hive contracted to one-third or fourth of the summer width.

Small colonies should be reduced to one set of combs in a single story, and any combs not covered by bees are best removed if the amount of stores is insufficient and has to be supplemented by feeding sugar syrup. The amount of honey or sugar syrup necessary to carry bees safely through the winter varies according to the strength of the colony, the locality, and the earlier or later flowering of the spring flora of the district. It is therefore not possible to state what the amount should be; it may, however, be laid down as a general rule that the combs which the bees cover at this time of the year should be at least more than half-full of sealed honey or sugar syrup. When sugar syrup has to be fed to supplement the stores it should be of the density of ripe honey, or approximately two (by weight) to one of water. The simplest way of making syrup is to pour the measured quantity of dry sugar into the correct amount of boiling water, keeping it on the stove and stirrring it till dissolved. The syrup should be given blood warm in a simplicity or frame feeder inside the hive.

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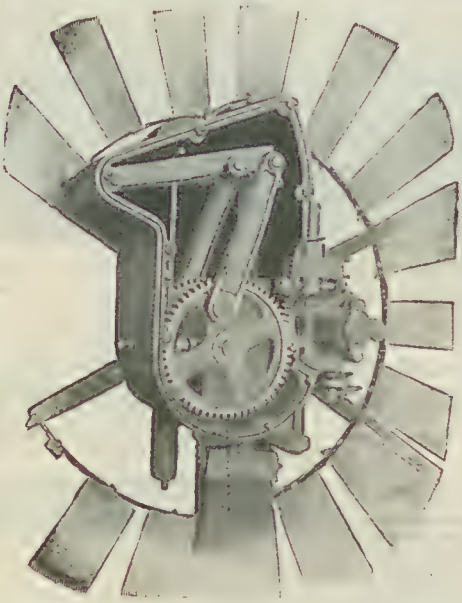

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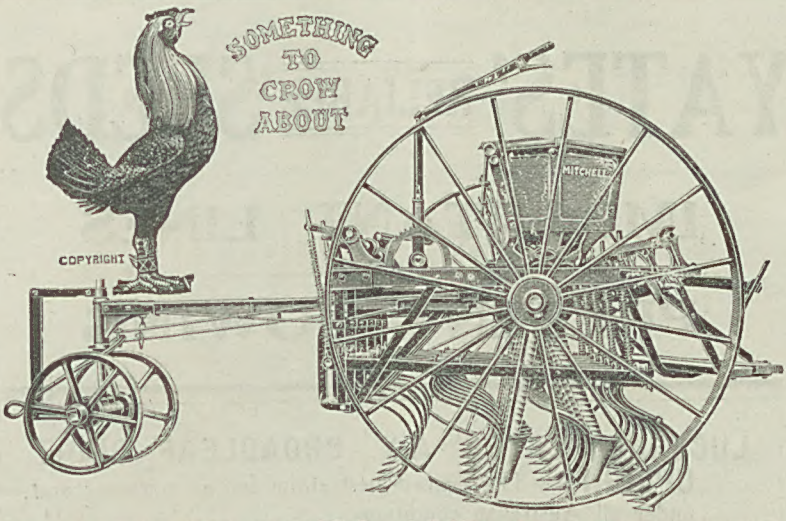


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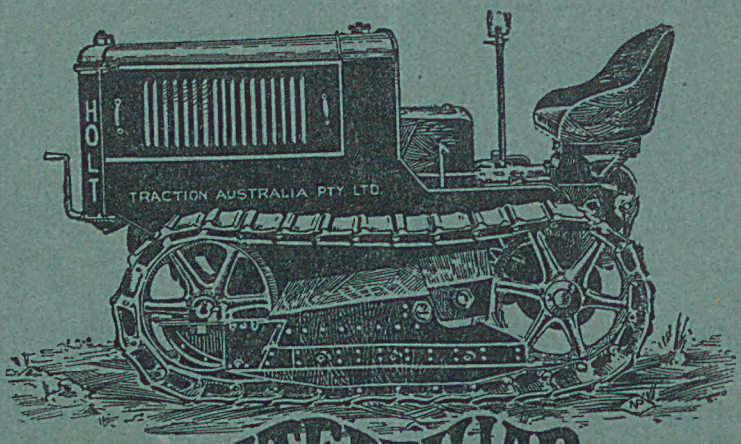


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